Glosten

STUDY OF A PORTABLE SEISMIC SYSTEM
ONBOARD THE R/V *ROGER REVELLE*

SEISMIC WORKSHOP

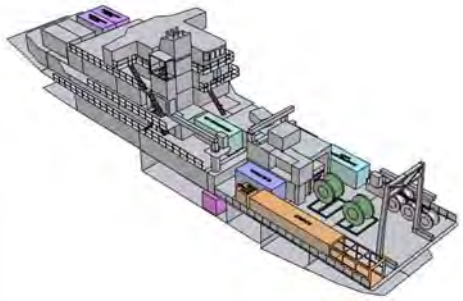
STUDY OBJECTIVES

Can a portable seismic system on the *Revelle* provide similar capabilities to the *Langseth*?

- ***Langseth* Capability**
  - *6600 in^3 source*
  - *3,300 CFM compressor with 100% redundancy*
  - *Four source sub-arrays*
  - *Streamers* — *2D* — *3D*
    - *Existing SYNTRAK* — *1 x 8 km* — *4 x 6 km*
    - *New Sercel* — *1 x 15 km* — *4 x 8 km*

STUDY OBJECTIVES

What size portable seismic system can fit on the *Revelle*?



STUDY ASSUMPTIONS

1. The system will not interfere with *Revelle*'s existing general oceanography missions

Photo credit: Brett Longworth

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2. **Permanent modifications are expected to support the Portable Seismic System and correct interferences**

Photo credit: Brett Longworth

STUDY ASSUMPTIONS

1. The system will not interfere with Revelle's existing general oceanography missions
2. Permanent modifications are expected to support the Portable Seismic System and correct interferences
3. **At least one large compressor will be installed permanently below decks**

Photo credit: Brett Longworth

STUDY ASSUMPTIONS

1. The system will not interfere with *Revelle*'s existing general oceanography missions
2. Permanent modifications are expected to support the Portable Seismic System and correct interferences
3. At least one large compressor will be installed permanently below decks
4. **The seismic deck gear will be portable to and from the *Revelle* by using truckable components**

Photo credit: Brett Longworth

STUDY ASSUMPTIONS

1. The system will not interfere with *Revelle*'s existing general oceanography missions
2. Permanent modifications are expected to support the Portable Seismic System and correct interferences
3. At least one large compressor will be installed permanently below decks
4. The seismic deck gear will be portable to and from the *Revelle* by using truckable components
5. **The system is not portable between vessels due to the permanent compressor installation and other modifications**

Photo credit: Brett Longworth

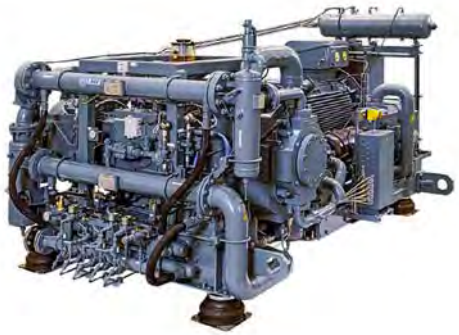
SEISMIC SYSTEM COMPONENTS

Source: 3300 in^3
1800 CFM air supply

- **Three compressors to supply with redundancy**
  - 1 x LMF 51 electric drive compound compressor supplying **1800 CFM**
  - 2 x LMF 21s electric drive compressors supplying **750 CFM** each – containerized

Shot Rate: 10 seconds

LMF 51

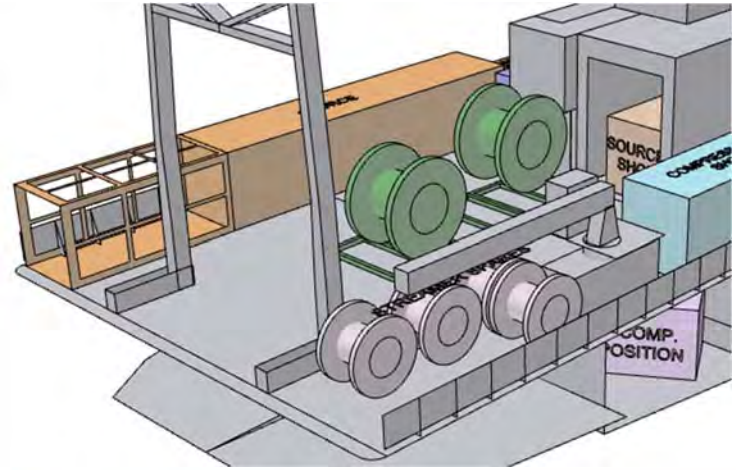


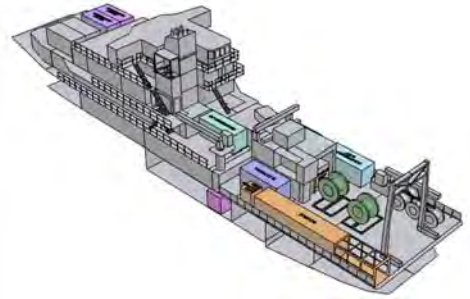
LMF 20s

SEISMIC SYSTEM COMPONENTS

Streamers:

- **Two 4 km Streamers**
  - Waterfall winch arrangement
  - 4 spools of spare streamer stowed on deck

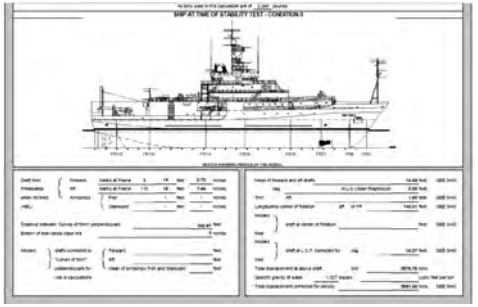




R/V *REVELLE* SEISMIC STUDY

What was examined?

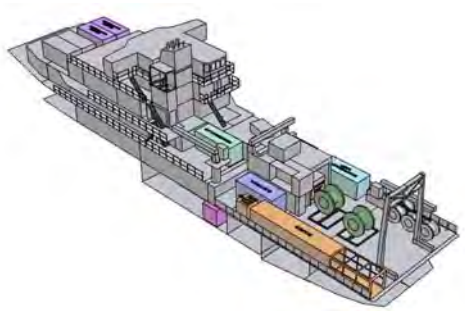
- Arrangements
- Stability
- Power & Tow capacity



ARRANGEMENTS

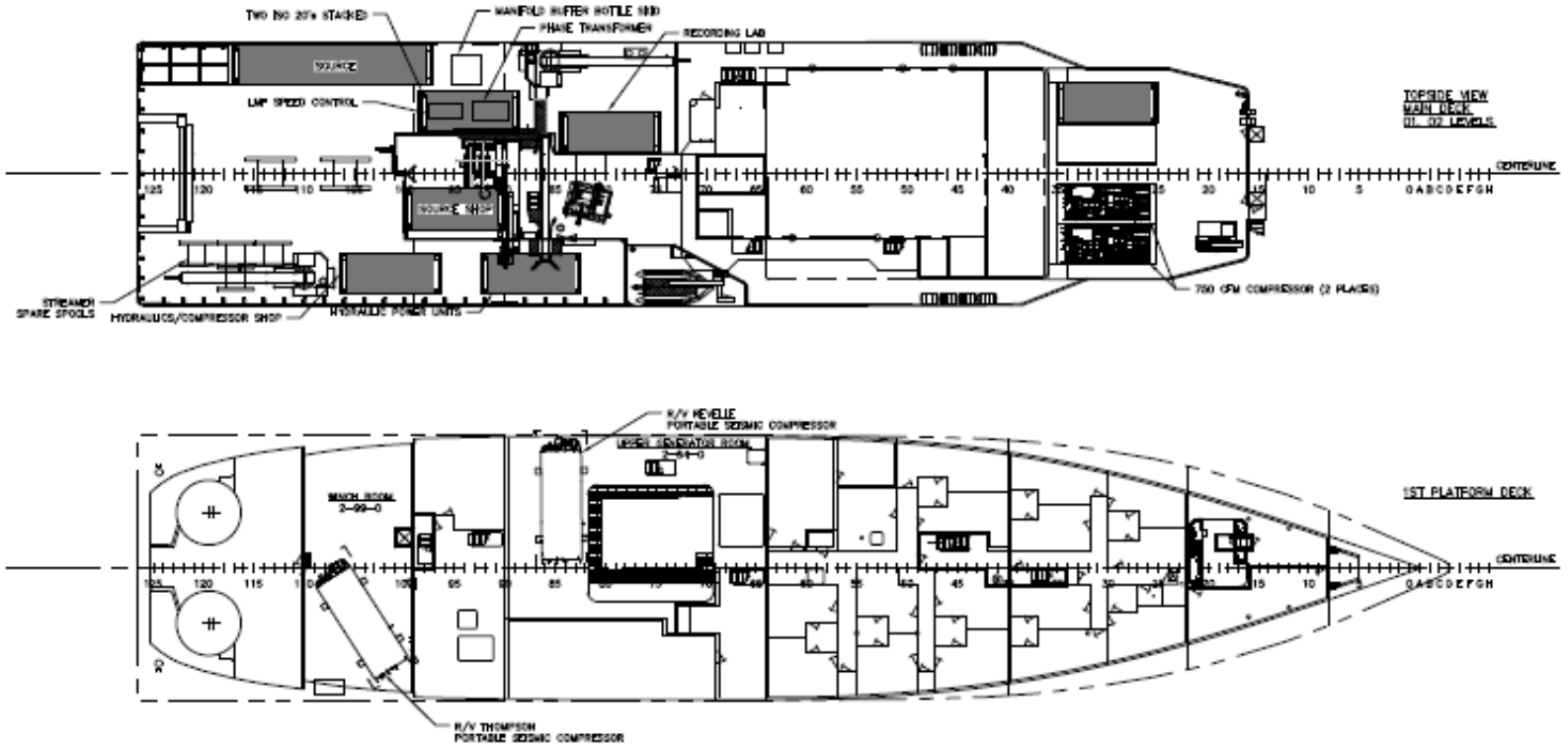
Equipment

1 x Port Source	ISO 40 ft
1 x Port Gun Rail	
2 x LMF 21s Compressors (750 CFM)	ISO 20 ft
1 x LMF 51 Compressor (1800 CFM)	Skid Mounted
1 x Compressor phase shift Xfmrs, speed controller	ISO 20 ft
2 x Streamer Winces	Skid Mounted
1 x Hydraulics/compressor parts-workshop van	ISO 20 ft
1 x Recording lab	ISO 20 ft
1 x Source workshop	ISO 20 ft
1 x High pressure manifold and buffer bottles	Skid Mounted
4 x Streamer spares	
1 x HPU	ISO 20 ft



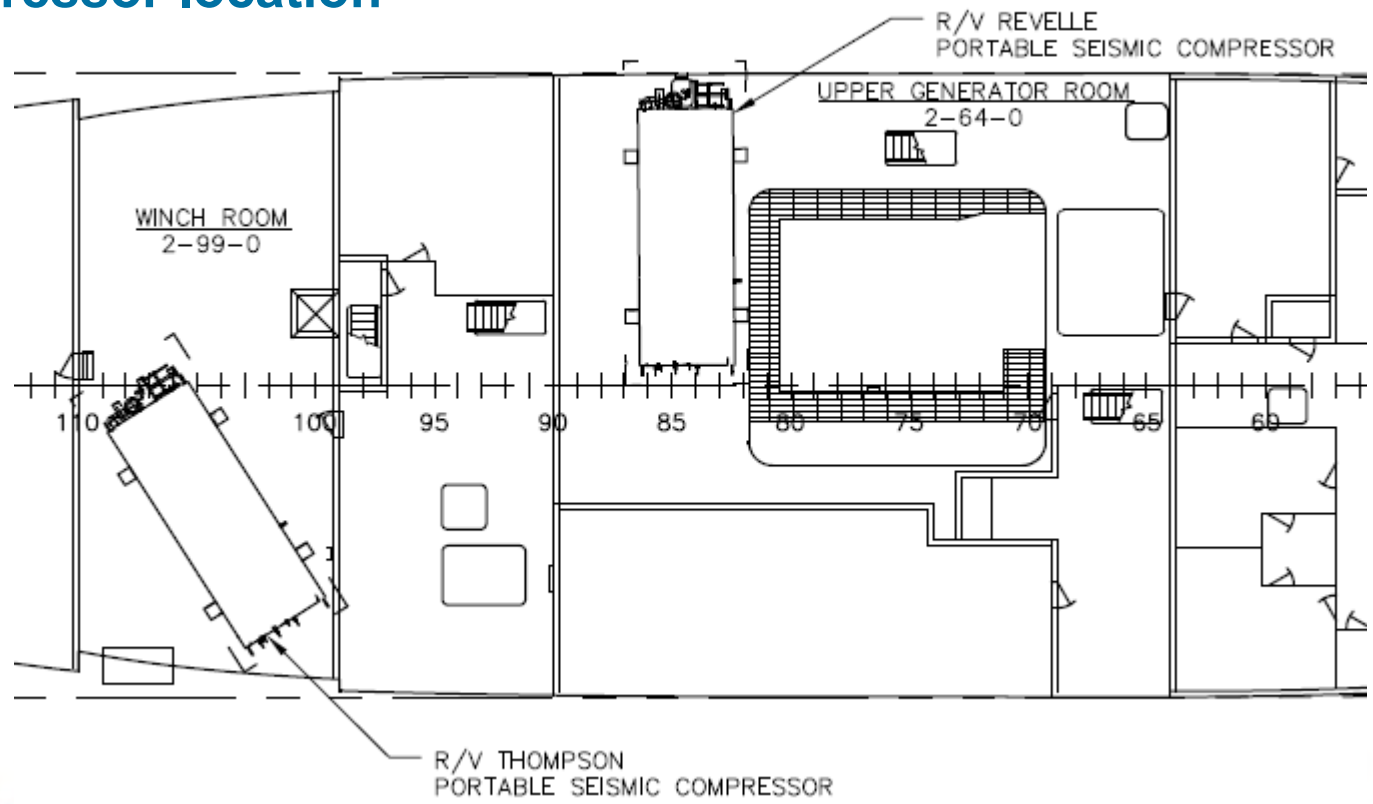
ARRANGEMENTS

Top view



ARRANGEMENTS

Large compressor location



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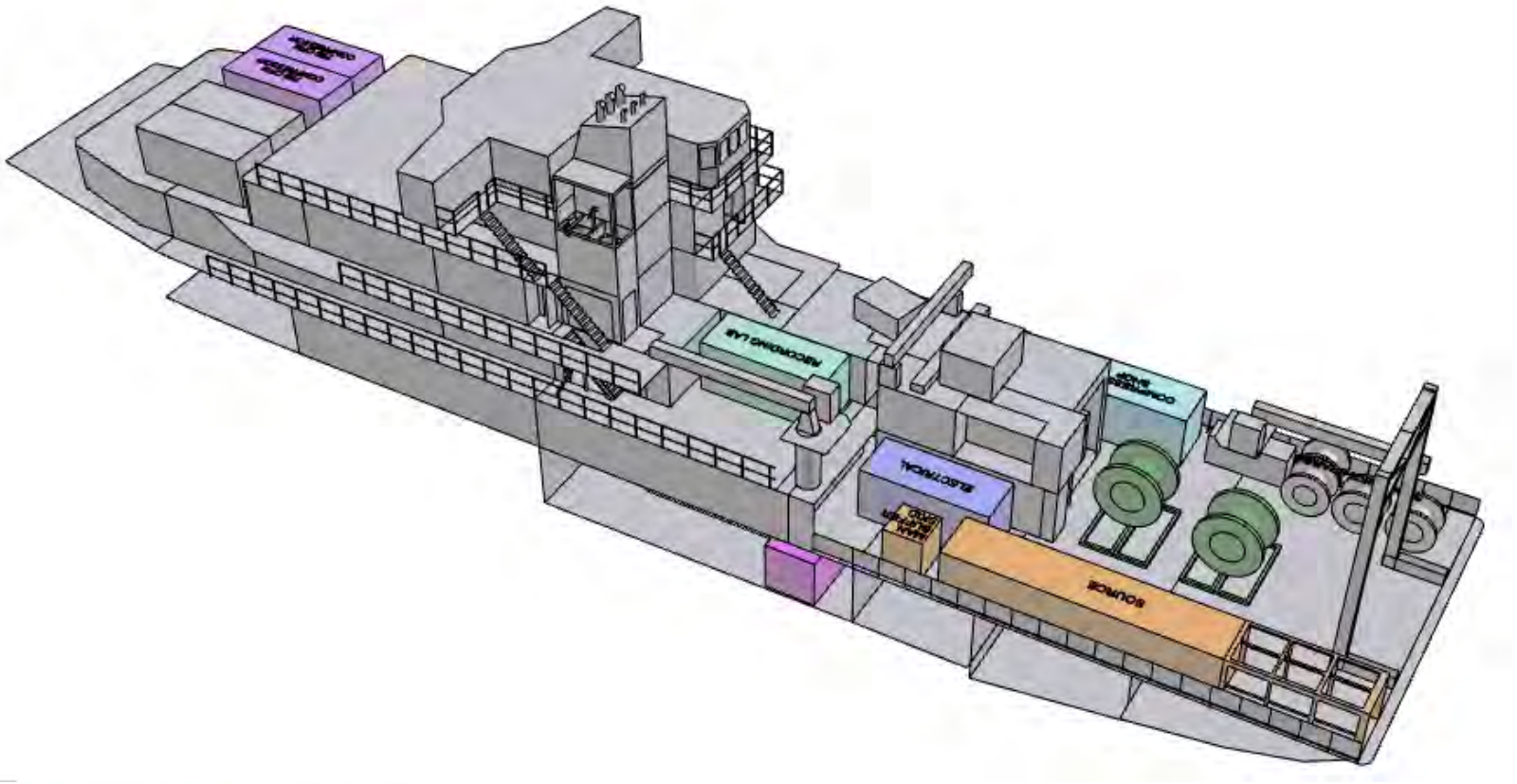
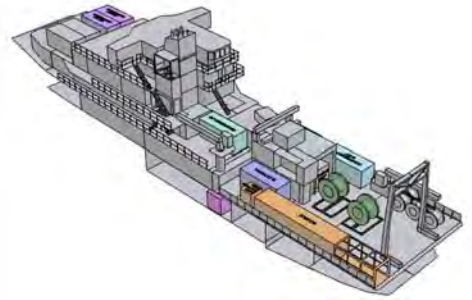


STABILITY

Load Case

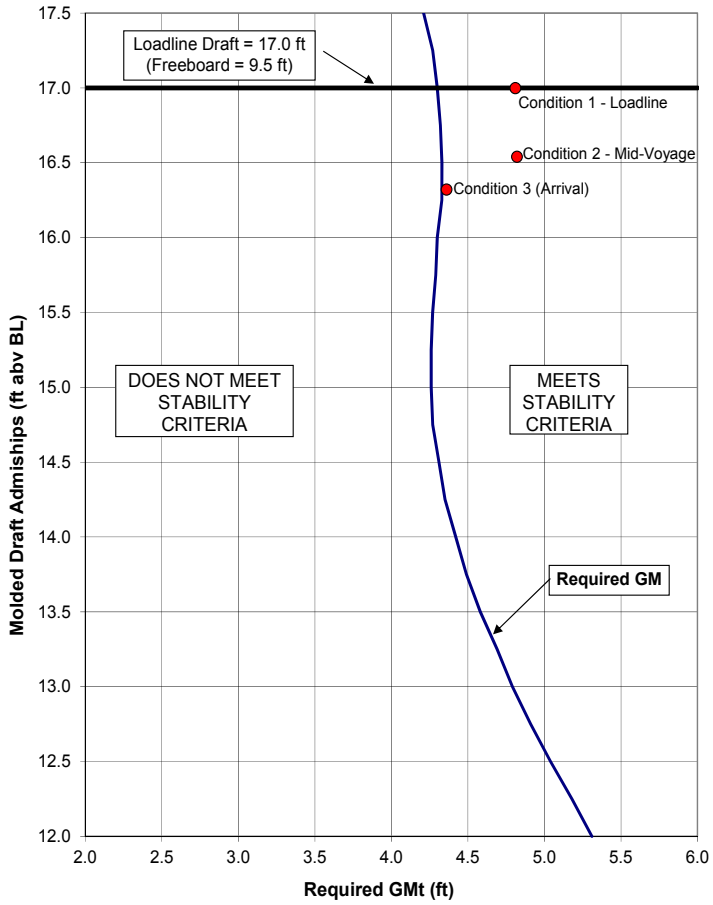
Item No	System	Weight (st)	LCG (ft aft of FP)	TCG (ft stbd of CL)	VCG (ft ABL)
1	Hydraulics/compressor parts-workshop van	9.00	200.00	20.70	30.50
2	Seismic air compressor (750 CFM)	16.00	57.00	6.00	47.00
3	Seismic air compressor (750 CFM)	16.00	57.00	18.00	47.00
4	Seismic air compressor (1800 CFM)	23.00	170.00	-12.00	21.00
6	Compressor phase shift Xfmrs, speed controller	4.00	185.00	-12.00	30.50
7	High pressure manifold and buffer bottles	2.50	187.00	21.00	28.50
8	Recording lab	8.00	155.00	-8.33	64.00
9	Source workshop	9.00	190.00	6.50	30.50
10	Port Source	30.00	215.00	-21.50	30.50
11	Port Gun Rail	4.00	242.00	-21.50	34.50
14	Streamer spares	10.00	242.00	26.00	64.00
15	Streamer winch 1	25.00	210.00	-3.00	31.50
16	Streamer winch 2	25.00	210.00	4.50	31.50
17	HPU's	5.00	177.00	20.70	30.50
	Total Mission Loadout	186.50	176.49	-0.21	35.72



STABILITY

Results

- Can meet stability requirements
- Anti-roll tank must be empty
- Needed to move items to starboard to balance vessel list in burn out condition



POWERING

Powering estimate is based on midlife repower of the *Thompson*

- **Installed power**
  - 2 x 2100 ekW generators
  - 2 x 940 ekW generators
  - 6080 ekW Total
- **Required Power for house and propulsion**
  - 2475 ekW for normal transit condition

POWERING

Powering estimate is based on midlife repower of the *Thompson*

- **Required Power for Seismic**
  - ~2500 ekW total installed
  - ~1300 ekW most likely scenario
- **Available Power for seismic**
  - 6080 ekW – 2475 ekW = 3605 ekW
  - In most cases have one large generator spare during seismic operations

Configuration: 4				2 X Caterpillar 3516C @ 2100 ekW					
Installed Power 6080 eKW				2 X Caterpillar C32 @ 940 ekW					
	Load	Gensets Online				Standby Gensets			
Load Case	ekW	Large	Small	Load	GPH	Large	Small	Total	ekW
Transit Full Power	5416	2	1	105%	**384.5**	0	1	1	940
Transit Full Power	5416	2	2	89%	391.4	0	0	0	0
Transit Normal	2475	1	1	81%	179.7	1	1	2	3040
Transit Normal	2475	1	2	62%	182.3	1	0	1	2100
Transit Normal	2475	2	0	59%	**174.7**	0	2	2	1880
On Station Normal	950	0	1	101%	70.3	2	1	3	5140
On Station Normal	950	0	2	51%	74.8	2	0	2	4200
On Station Normal	950	1	0	45%	**69.3**	1	2	3	3980
On Station Normal	950	1	1	31%	76.3	1	1	2	3040
On Station High	1350	0	2	72%	102.8	2	0	2	4200
On Station High	1350	1	0	64%	**95.3**	1	2	3	3980
On Station High	1350	1	1	44%	101.4	1	1	2	3040
On Station High	1350	1	2	34%	107.4	1	0	1	2100
In Port Normal	250	0	1	27%	**20.7**	2	1	3	5140
In Port Normal	250	1	0	12%	28.1	1	2	3	3980
In Port High	400	0	1	43%	**31.8**	2	1	3	5140
In Port High	400	1	0	19%	37.1	1	2	3	3980

Figure 8 Integrated Bus Configuration 4: Load combinations and spare capacity

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SUMMARY

- **It is not possible to match the capability of the seismic system of the Langseth in a portable system aboard the *Revelle* or *Thompson*.**
- **Maximum capacity of portable system on *Revelle* / *Thompson* is:**
  - 3300 in^3 source
  - 1800 CFM compressor capacity
  - Two source sub-arrays with 10 second shot rate
  - Two 4 km streamers

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Zoom = mouse wheel Rotate = left click + drag Pan = ctrl + left click + drag

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