



INMARTECH 2006

Improvement of Air-gun system for Multi-channel Seismic Survey

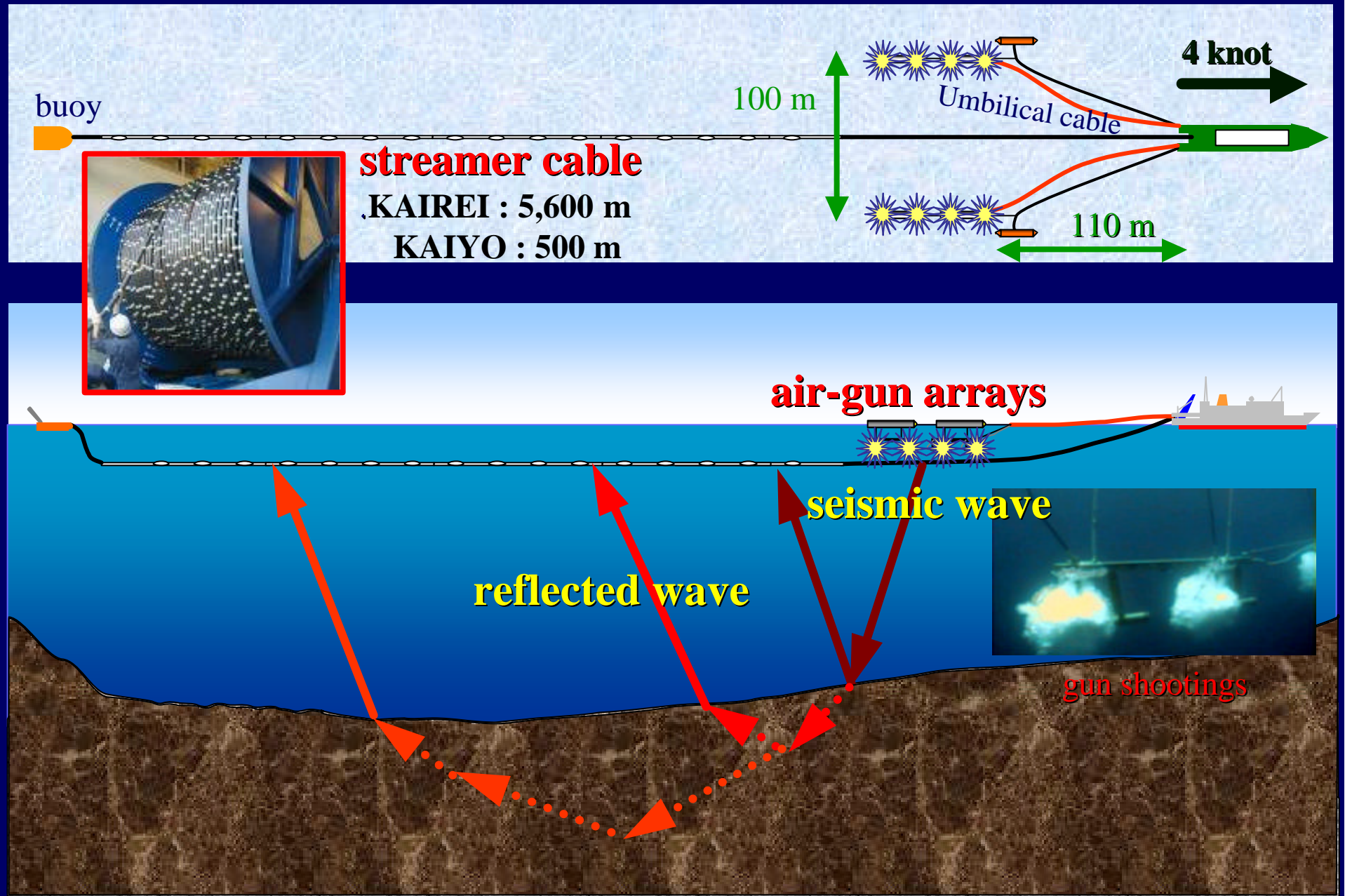


Hidenori Shibata



Nippon Marine Enterprises Ltd.

Multi-Channel-Seismic Survey





MCS systems of JAMSTEC



R / V KAIYO



R / V KAIREI

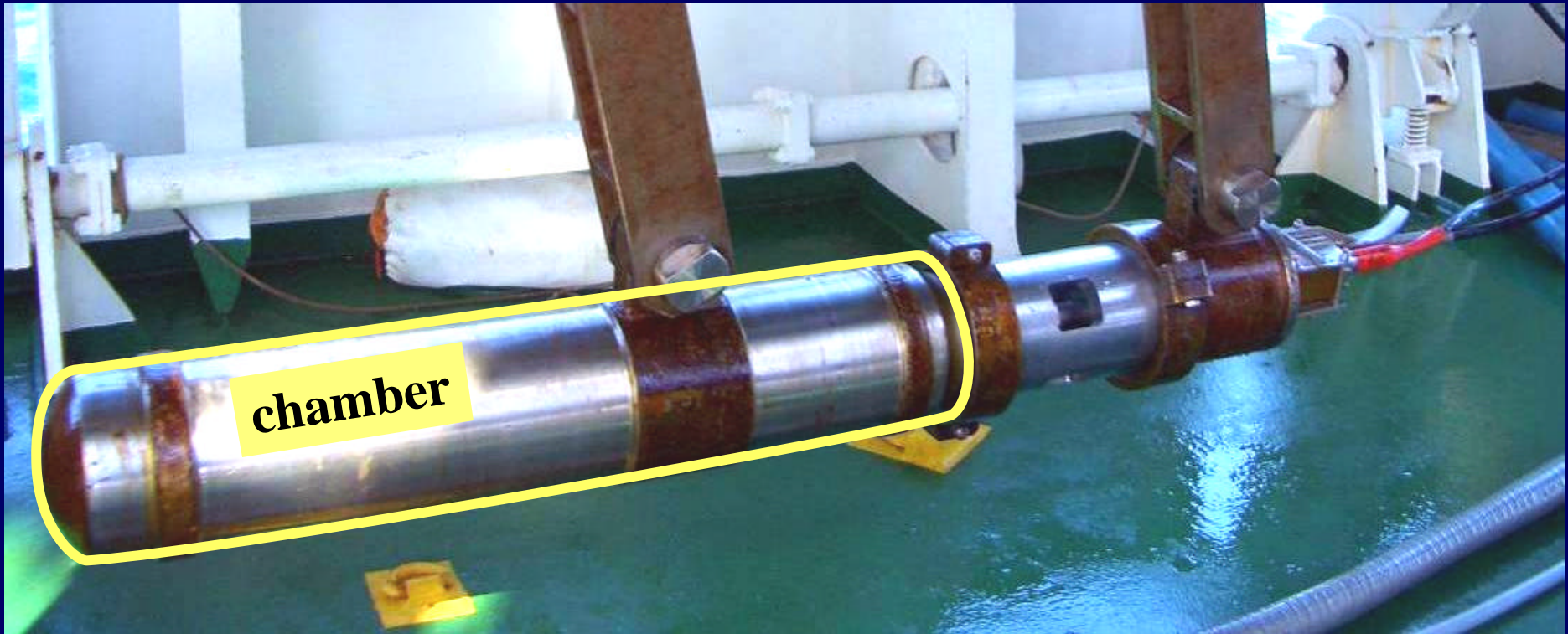


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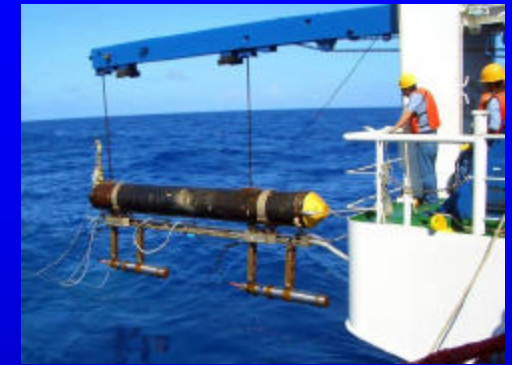
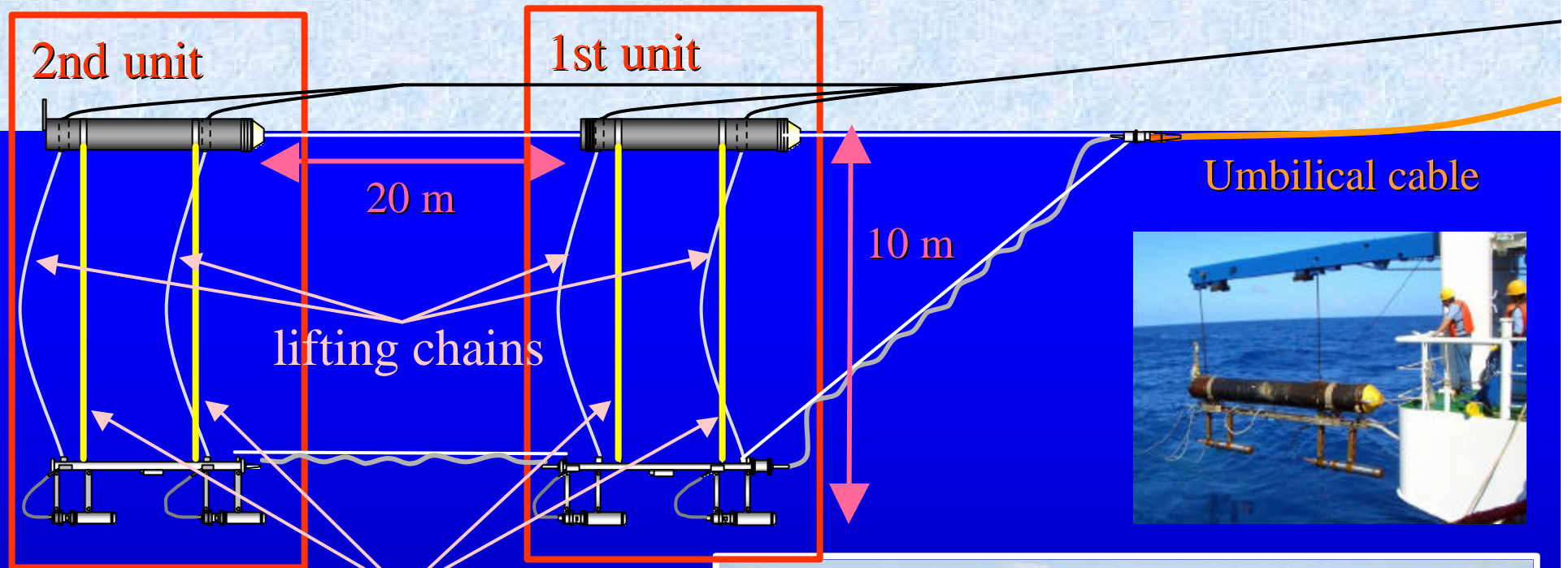
RV
KAIREI

Air-gun (seismic source generator)

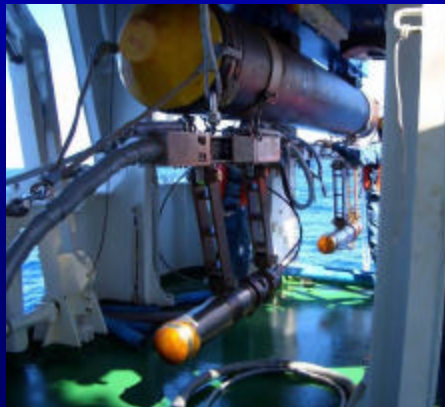
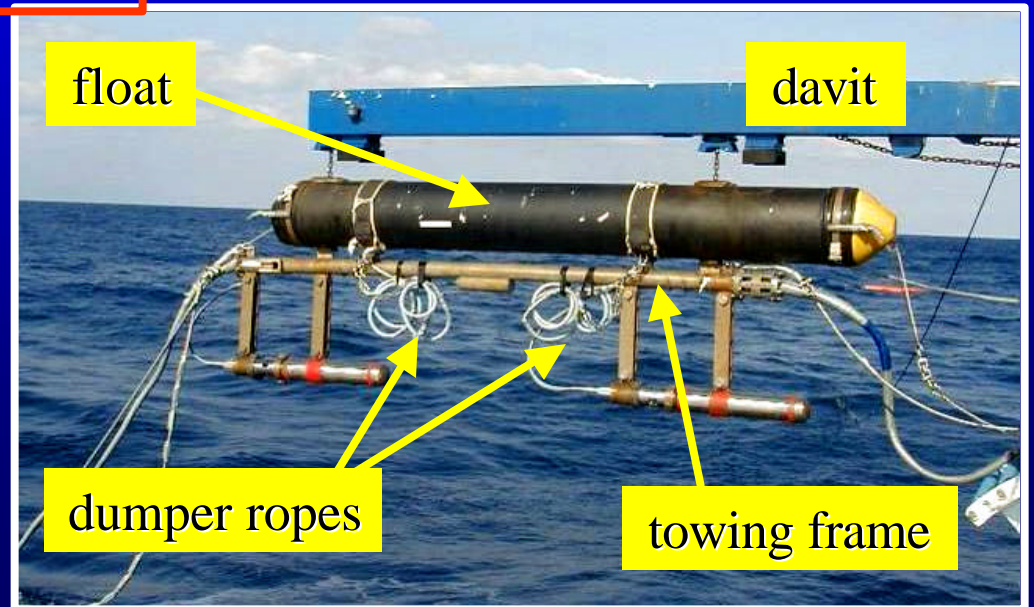


type	1500LL (Bolt technology corp.)
chamber volume	<u>1,500 cu.in</u> (0.025 m ³ : / gun) 12,000 cu.in (0.20 m ³ : 8 guns total)
Sound Peak Level	261 dB (8 guns total)
weight	216 kg (in air : / gun)

Air-gun array (KAIREI)



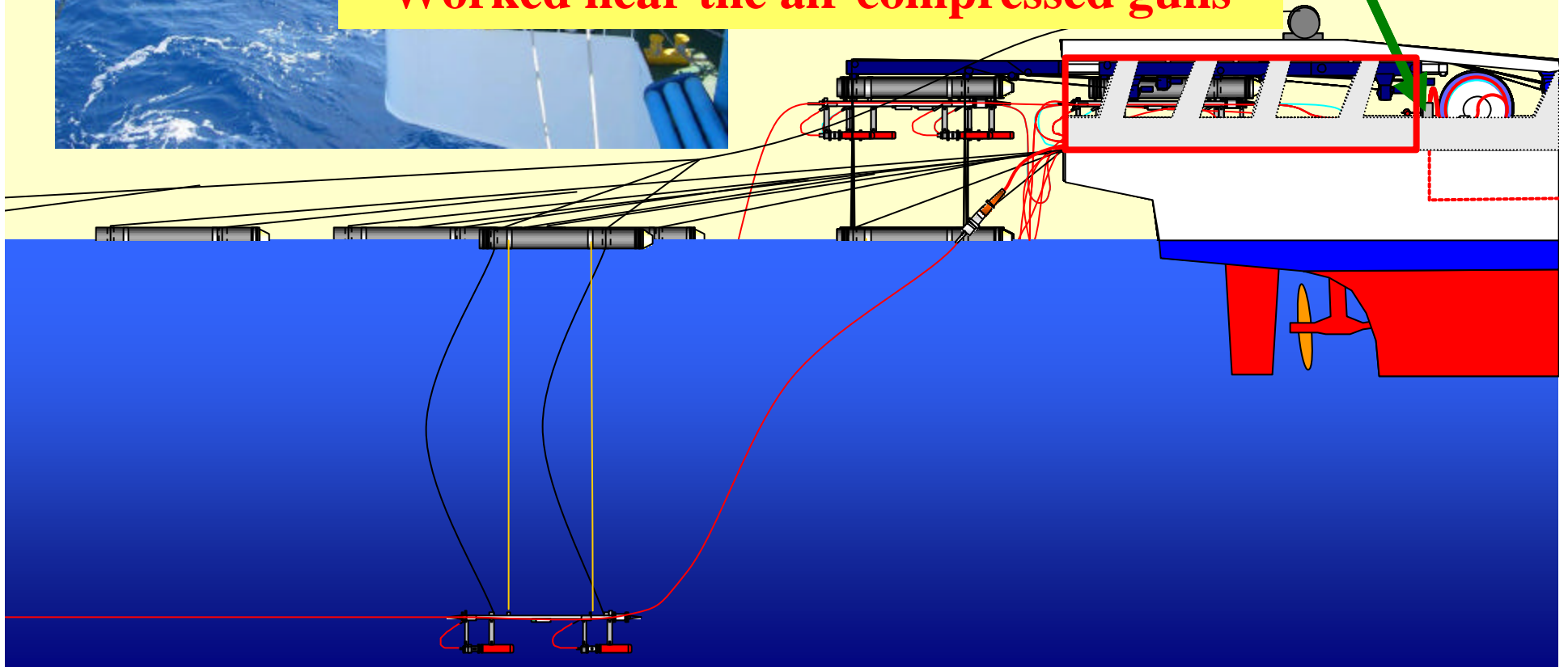
dumper ropes



Operations on KAIREI



All guns was pressurized at once
Worked near the air compressed guns



Air-gun shooting movie



Problems of previous system

1. Towing frame

cracked in 2004

not easy maintenance

towing position

dumper rope damage

2. Dangerous operation

worked near the air pressurized guns

3. Not efficient

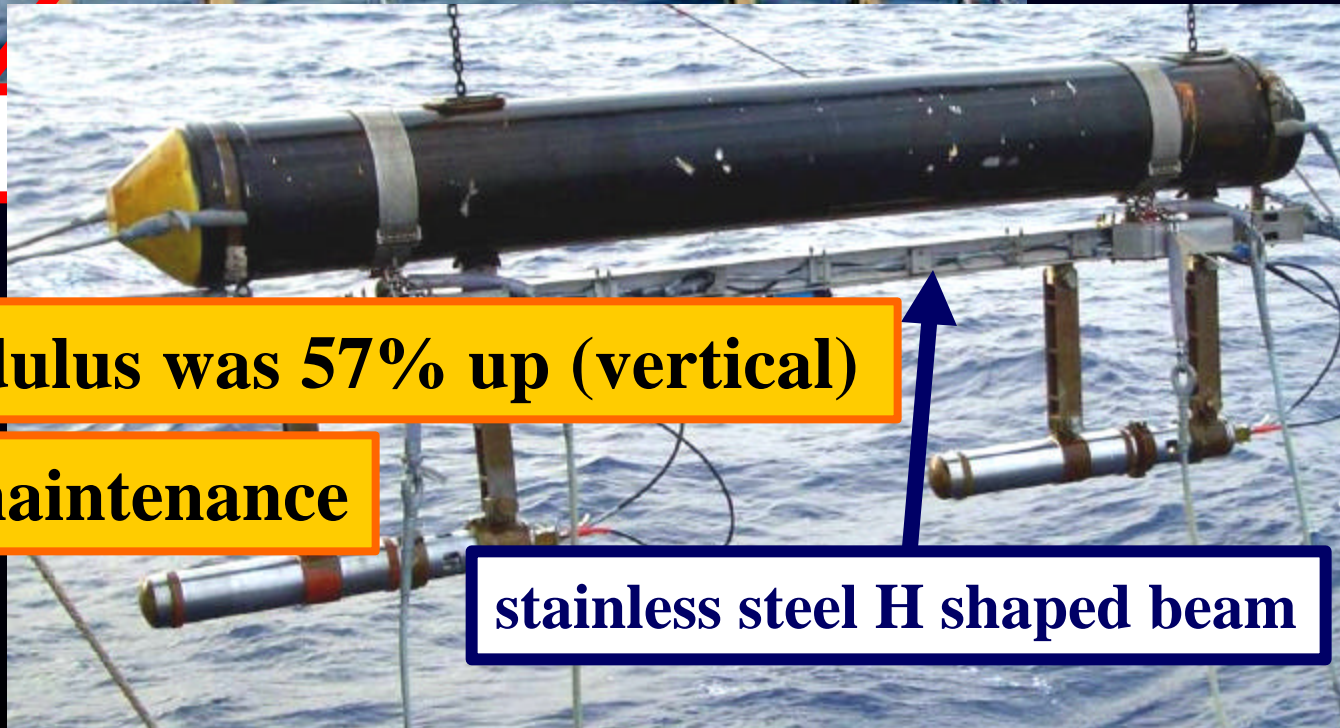
no backup of air leakage

Changed towing frame



cracked in 2004

stainless steel

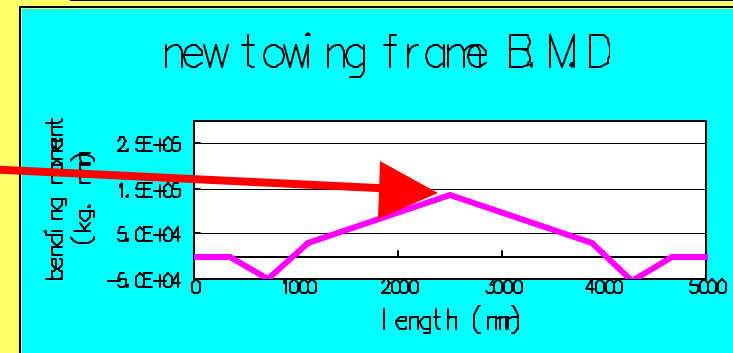
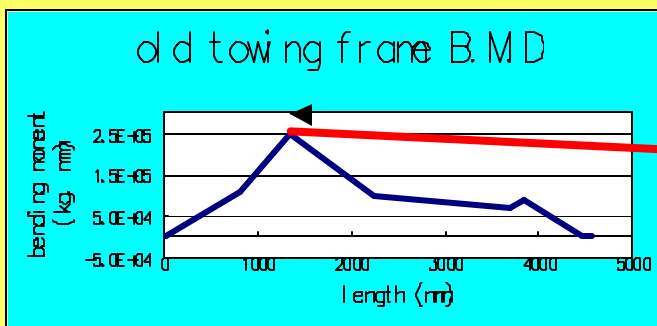
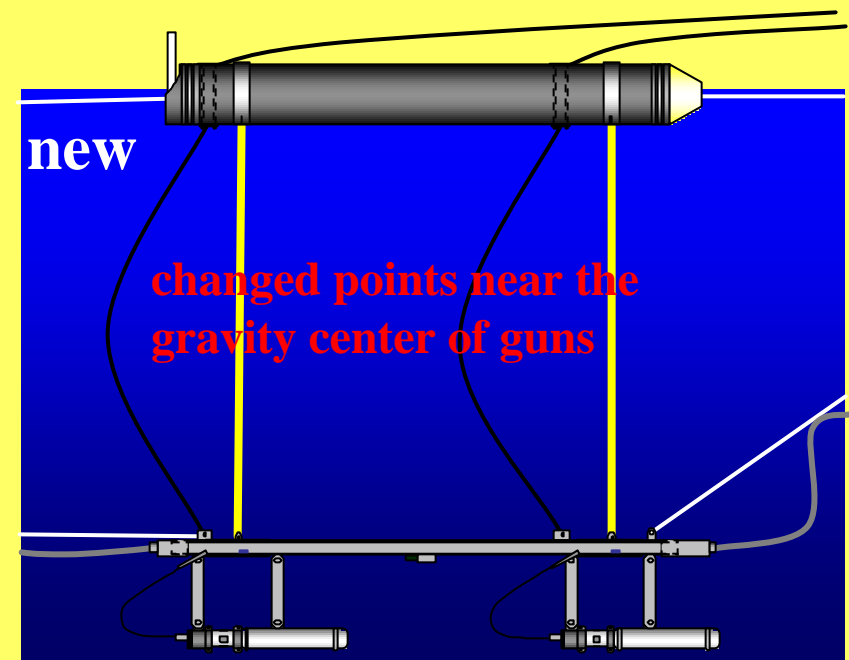
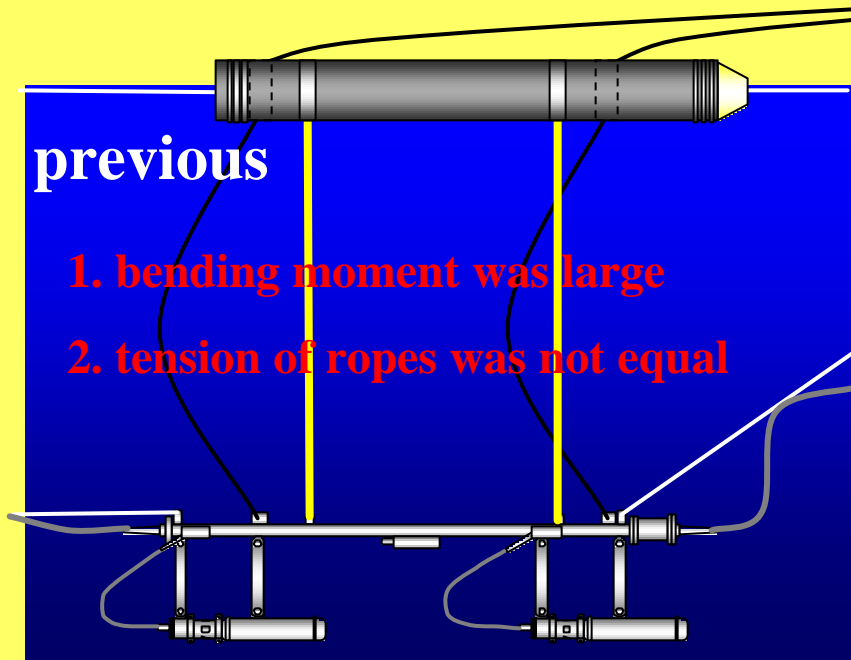


Section modulus was 57% up (vertical)

Easy maintenance

stainless steel H shaped beam

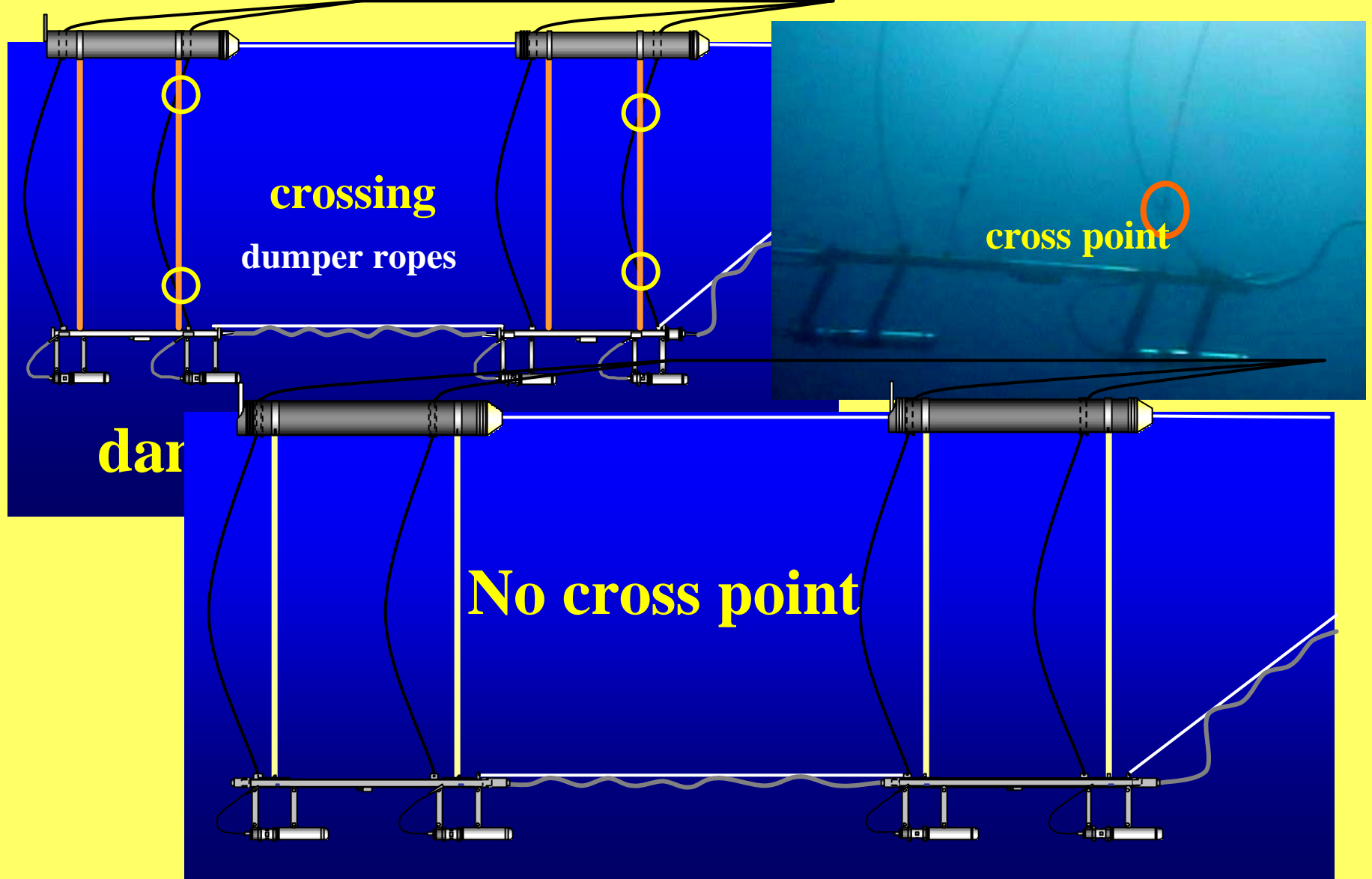
Changed tow point positions



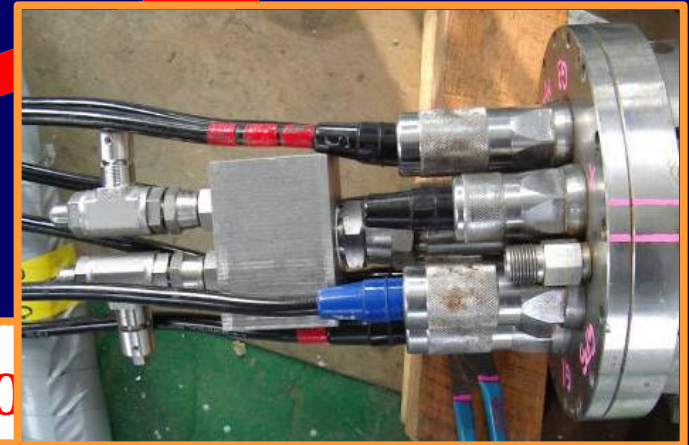
bending-moment was 45% reduced

Damage of ropes

lifting chains



Changed air line

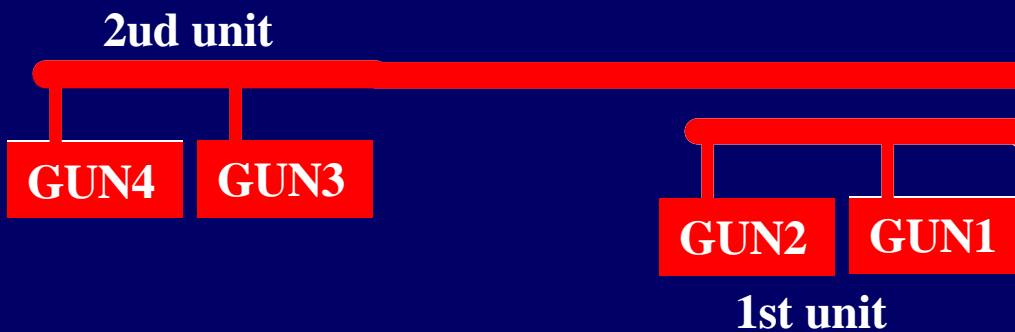


Air was supplied all guns at o

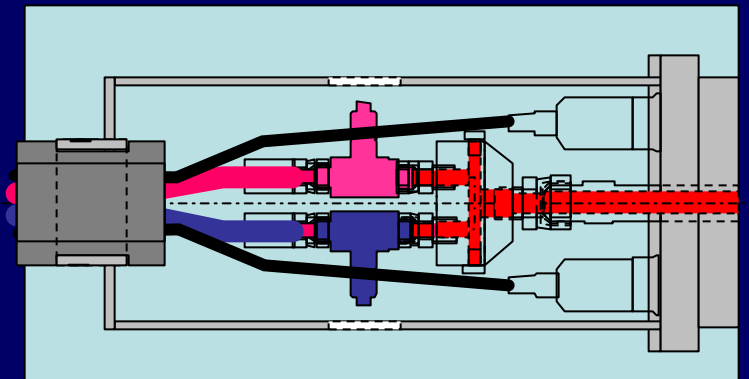
valve

Umbilical cable

valve

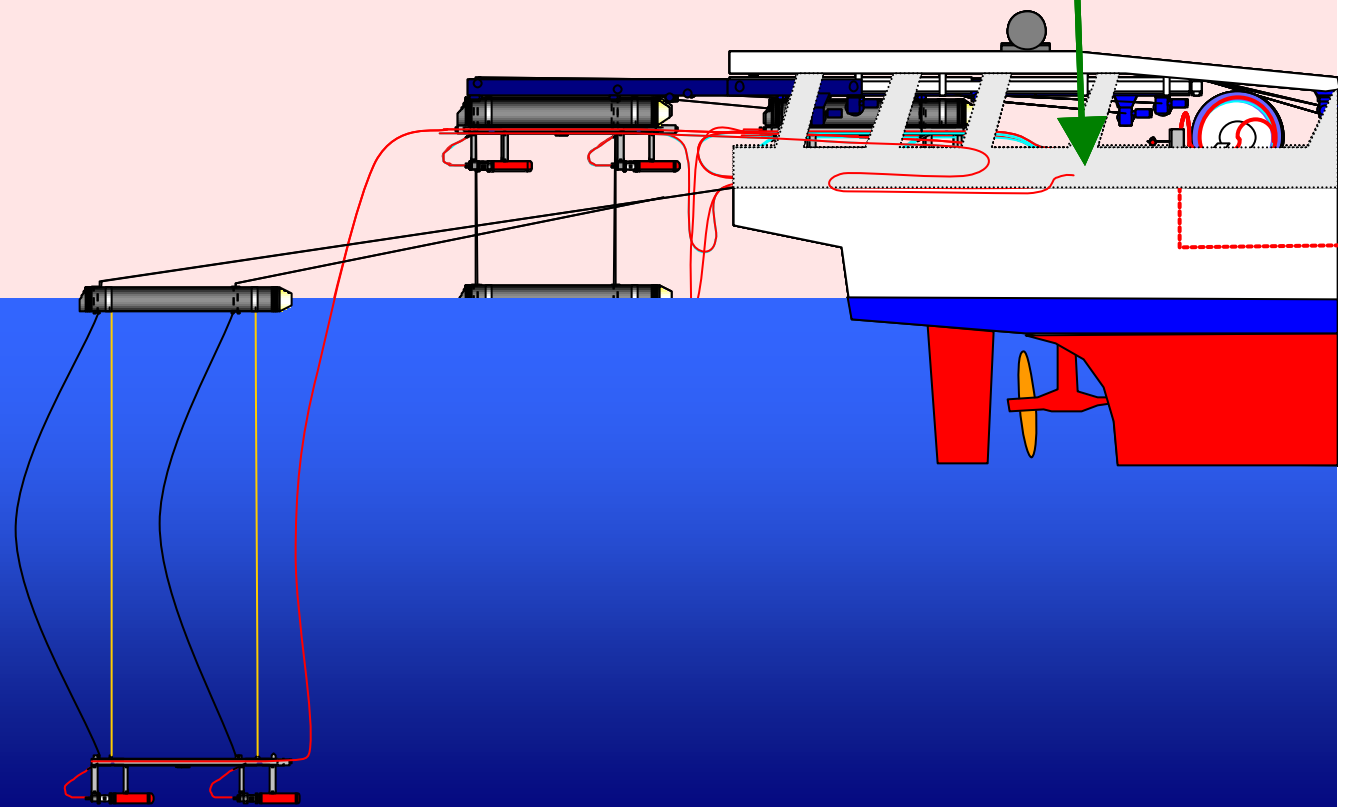


Control air independently



New system operation

valve 2nd open
1st open



More efficient

Air leakage

? had to recover the array

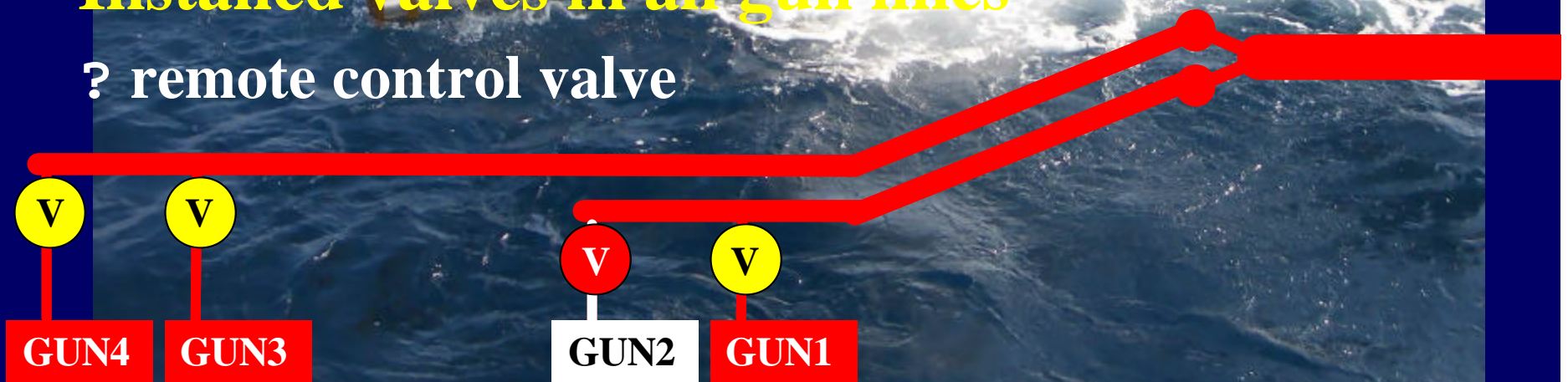
? ship time loss

(KAIREI : over 8 hours)

because of long streamer (5,600m)

Installed valves in all gun lines

? remote control valve



Summary

1. Stronger

- ? designed new towing frame
- ? change towing point
- ? change layout of dumper ropes and chains

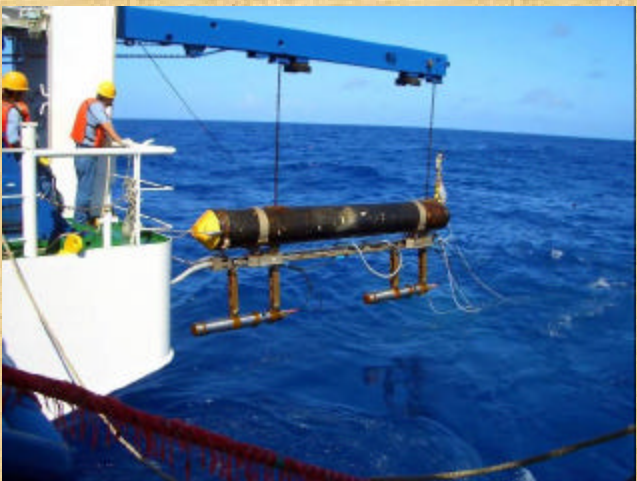
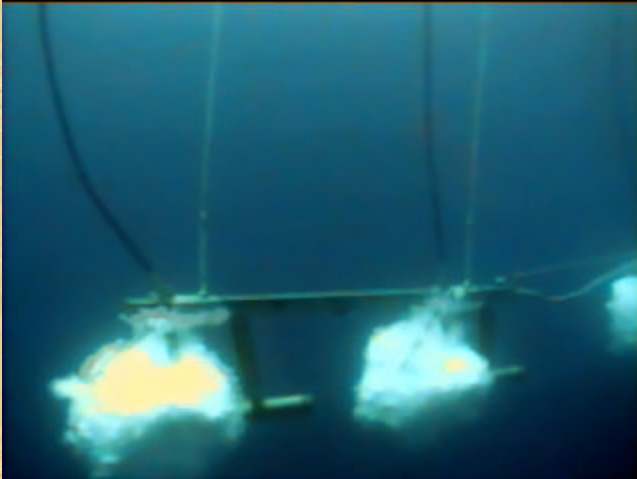
2. Safer

- ? separated air line and added valves

3. More efficient

- ? installed remote control valves in all gun air lines

Thank you !



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Specification of the MCS system

	description
air-gun	type : 1500 LL (Bolt technology corp.) volume : 1,500 cu.in (0.025 m³)×8 =12,000 cu.in (0.2 m³) pressure : 2,000psi (13.8 MPa) depth : 10 m frequency: 50 Hz
streamer cable	length : 4,200 m @75 m×56 channel number : 168 ch depth : 15 m (attached 16 depth controllers)
recording	sampling rate : 4 ms recording length : 13.5 sec

Air-gun seismic wave generator

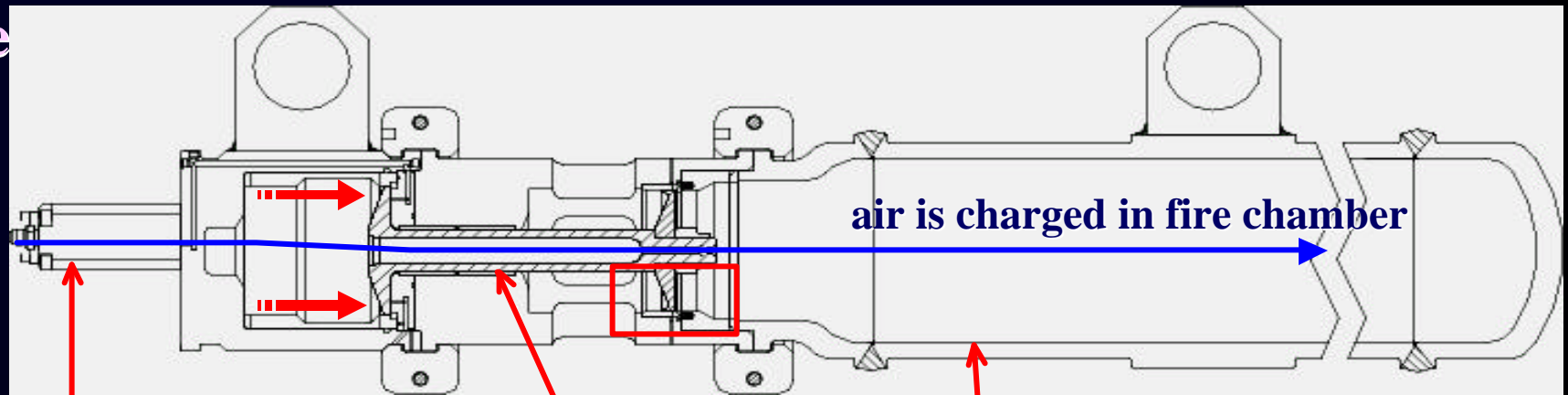
type : Bolt technology corp. 1500LL

volume : 1,500 cu.in (0.025m³)

pressure : 2000 psi (13.8MPa)

depth : 10m

charge

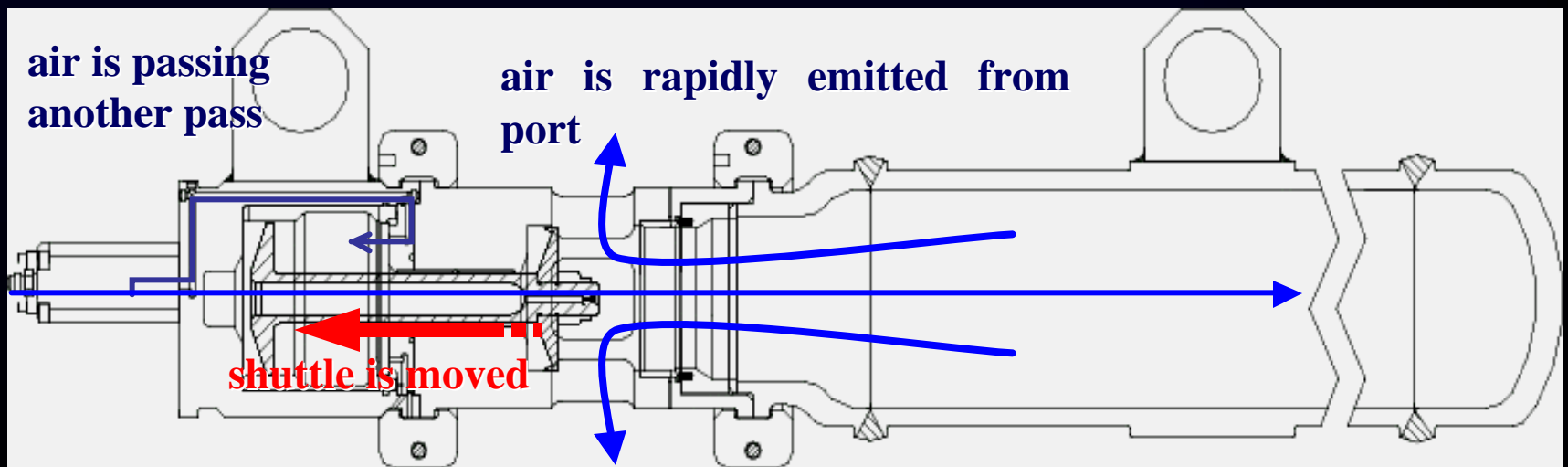


solenoid valve

shuttle

fire chamber

fire



air is passing
another pass

air is rapidly emitted from
port

shuttle is moved