



# 海下科技與海域空難調查

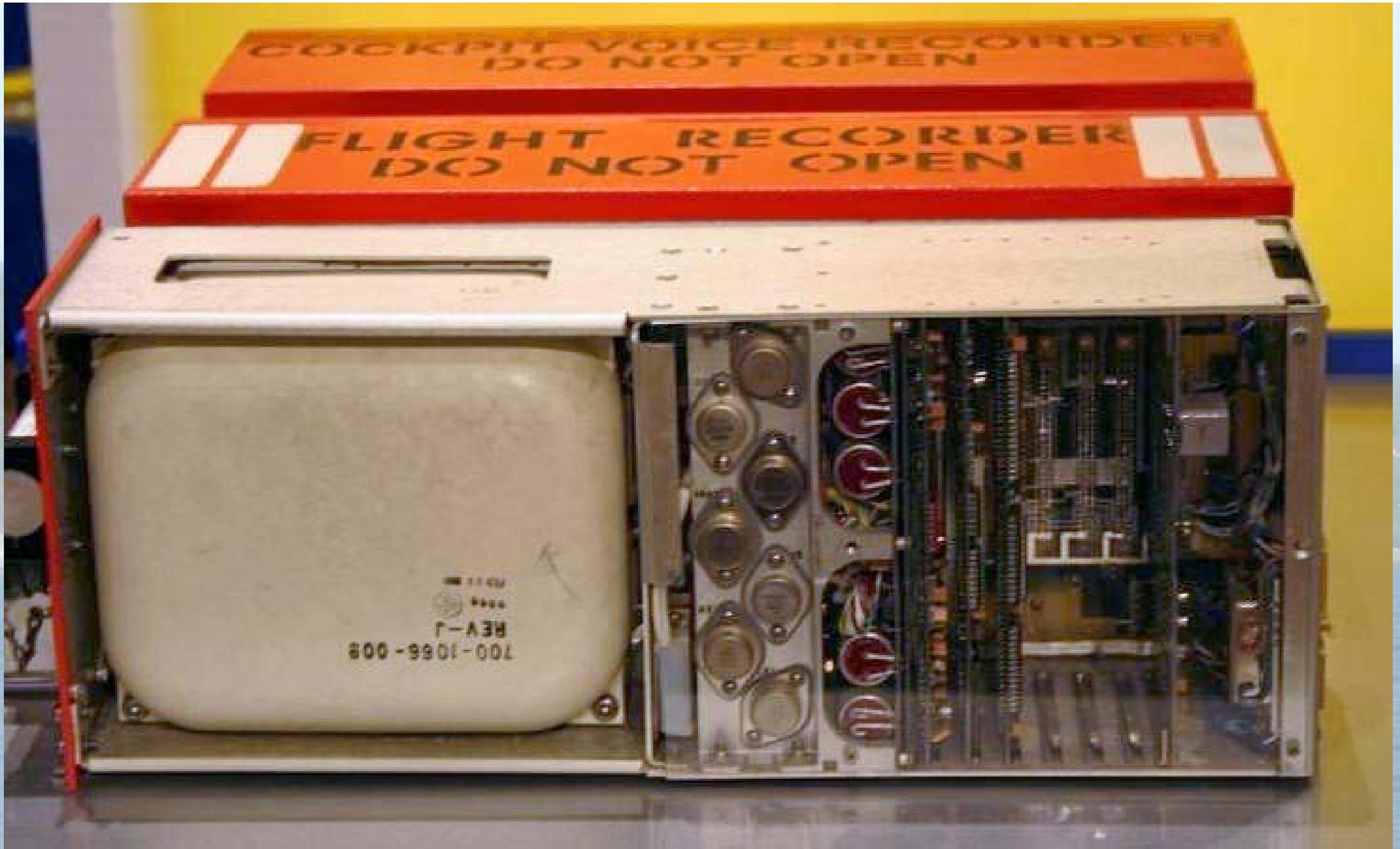
中山大學

海洋科學學院

海下科技研究所

王兆璋 邱永盛 張元櫻

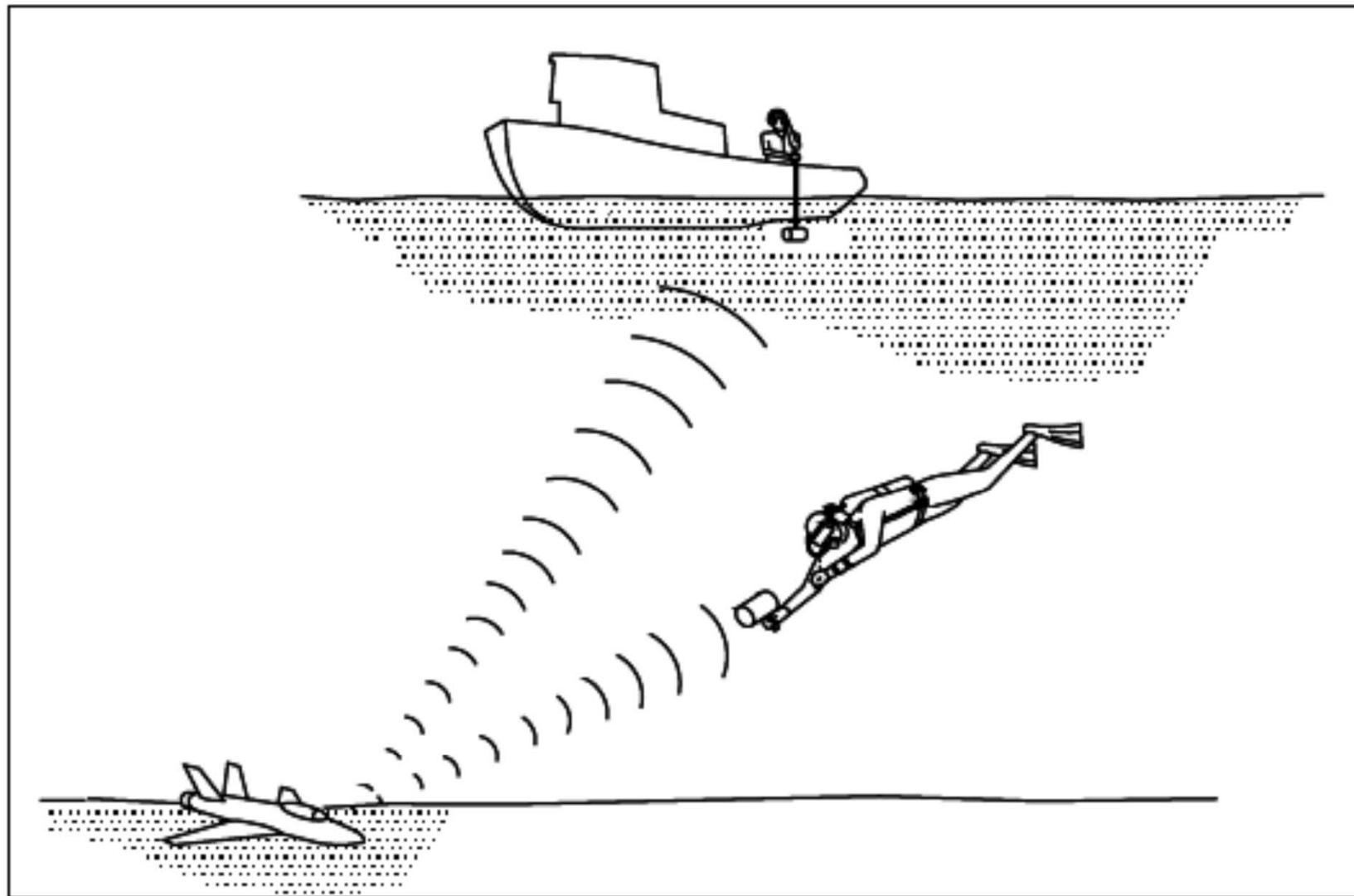
[chauwang@mail.nsysu.edu.tw](mailto:chauwang@mail.nsysu.edu.tw)





## General Specifications

<b>Operating Frequency:</b>	37.5 kHz, $\pm$ 1 kHz
<b>Operating Depth:</b>	0 to 20,000 feet (6,096 meters)
<b>Pulse Length:</b>	$\geq$ 9 ms
<b>Pulse Repetition Rate:</b>	$\geq$ 0.9 pulses per second
<b>Battery:</b>	Lithium P/N C362-04270-2, standard (Lithium content = 0.7grams)  Lithium P/N C362-04270-1, <i>optional</i> (Lithium content = 1.8 grams)
<b>Operating Life:</b>	$\geq$ 30 days with standard lithium battery $\geq$ 90 days with <i>optional</i> lithium battery
<b>Battery Storage Life in Beacon:</b>	7 years
<b>Acoustic Output:</b>	$\geq$ 160.5 dB re 1 $\mu$ Pa @ 1 meter
<b>Acoustic Output After 30 Days:</b> (with standard lithium battery)	$\geq$ 157.0 dB re 1 $\mu$ Pa @ 1 meter
<b>Acoustic Output After 90 Days:</b> (with optional lithium battery)	$\geq$ 157.0 dB re 1 $\mu$ Pa @ 1 meter
<b>Activation:</b>	Fresh or salt water immersion
<b>Beam Pattern:</b>	80% sphere



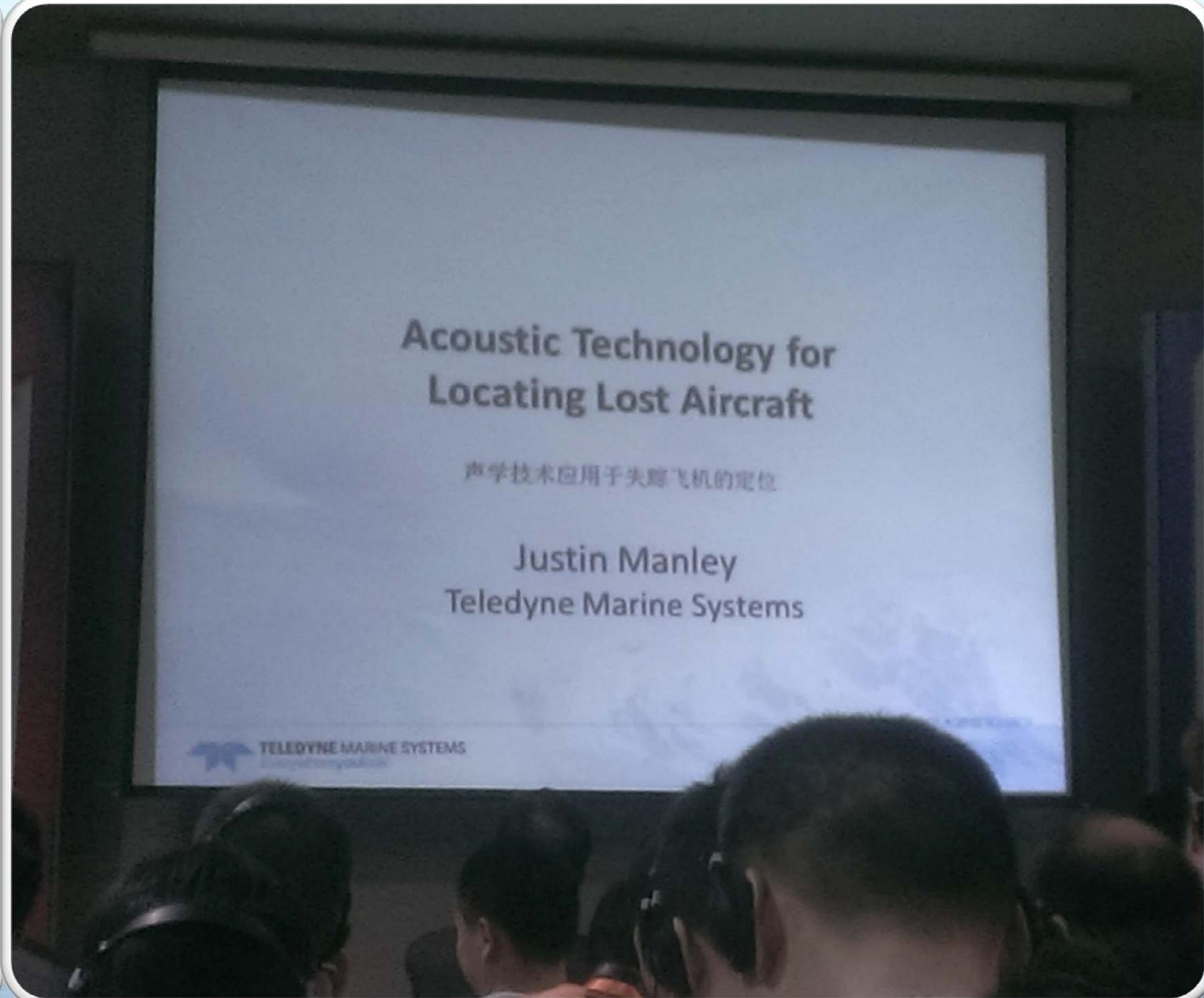
**Figure 1-4 Locating the Aircraft After Water Activation**

AF 447



MH 370





## Concept of Operation 作业观念

- Most aircraft crash in shallow water (easily accessible by diver or remotely operated vehicle)

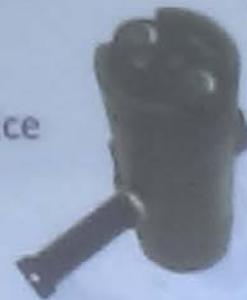
大部分飞机失事是在浅水区域（通过潜水员或水下ROV容易找到）

- Debris field is in small, known, area

残骸区是一个已知的小区域

- Simple directional acoustic listening device can find the black boxes

简单的声学定向设备能够找到黑匣子



Diver Pinger Locator

潜水员手持式 Pinger定位器

AVAILABLE FOR  
LE Q3/2013

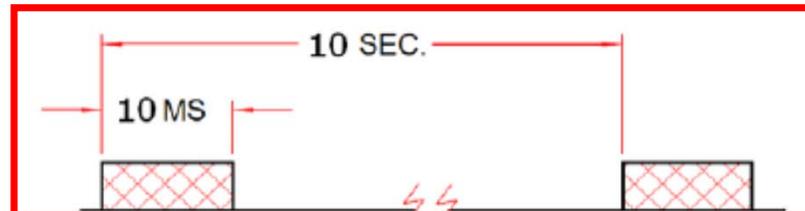
# DK180

## Low Frequency Acoustic Beacon



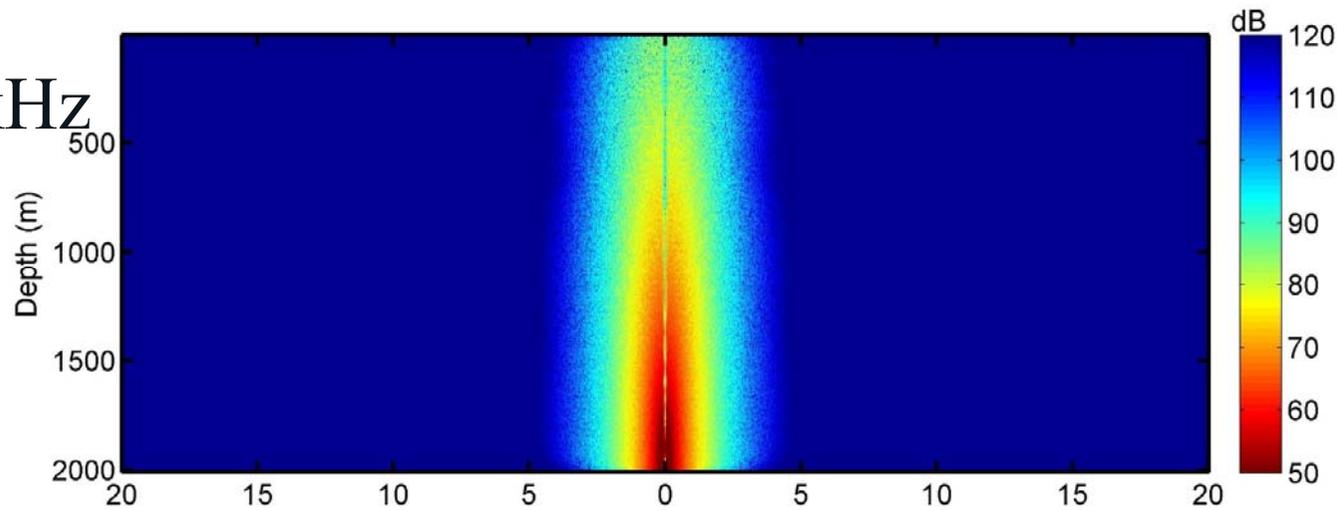
### Beacon Specifications

Operating Frequency.....	8.8 kHz $\pm$ 1 kHz
Pulse Width.....	10 milliseconds min.
Pulse Repetition Rate.....	10 Sec max.
Power Source.....	Lithium battery
Operating Life.....	30 Days
Actuation.....	Fresh or salt water
Size.....	2.0 in (5.1 cm) diameter 6.0 in (15.2 cm) long
Weight.....	26 oz (unit), 16 oz (mounting bracket/hdwr)
Operating Depth.....	Surface to 20,000 ft (6096 m)
Case Material.....	Aluminum
Acoustic Output.....	160 dB re 1 $\mu$ Pa at 1m
Warranted Life.....	5 years from date of manufacture

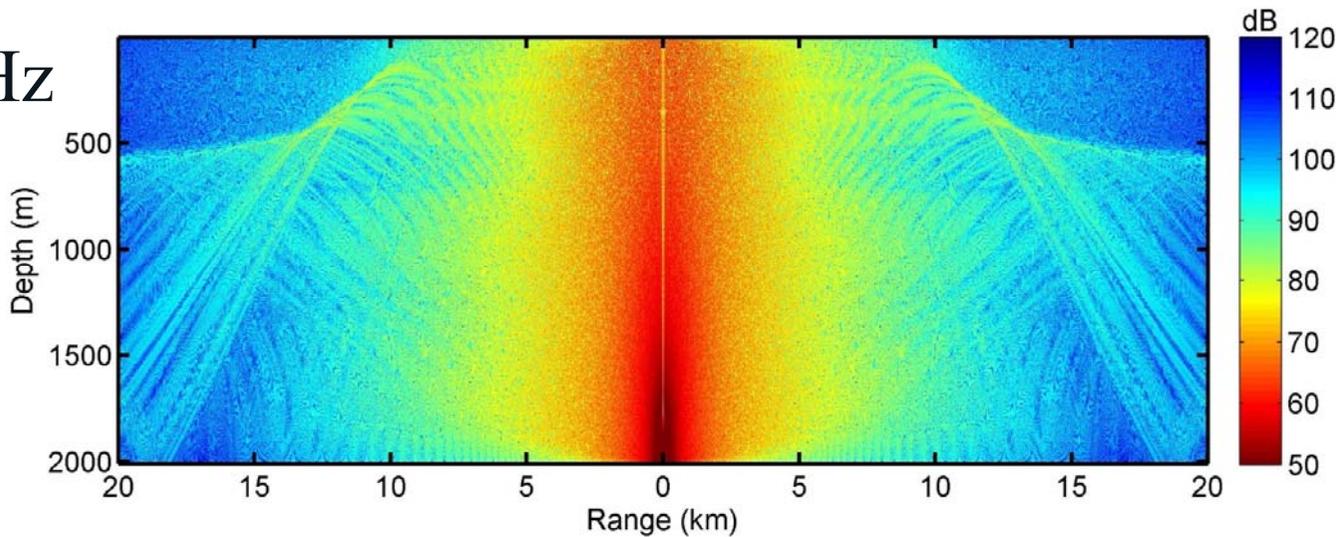


# Flight Data Recorder/Cockpit Voice Recorder Locator Beacon 音傳特性

35 kHz

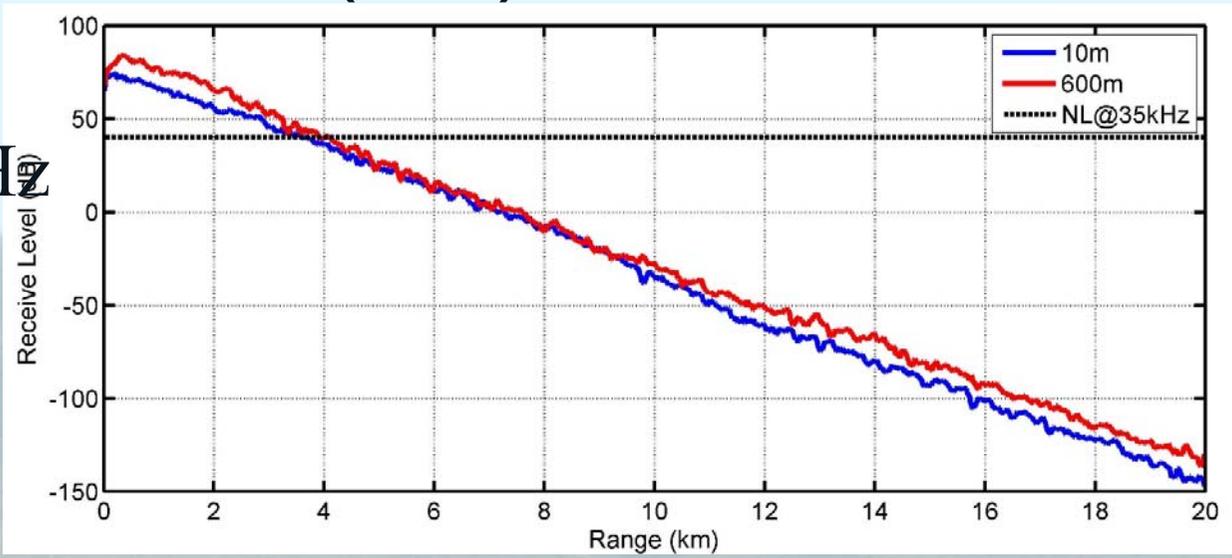


8 kHz

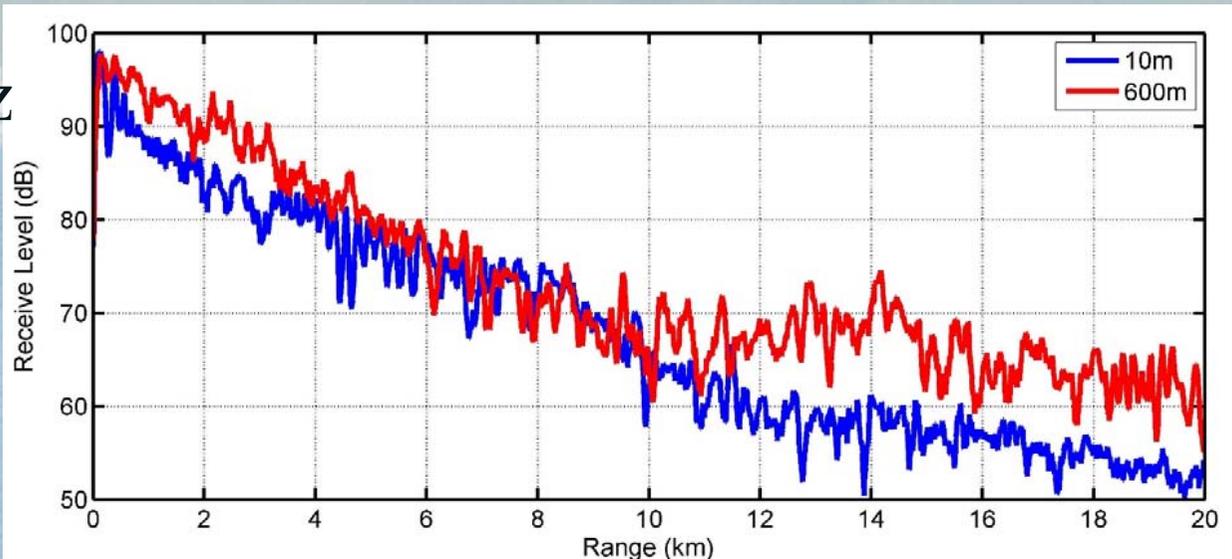


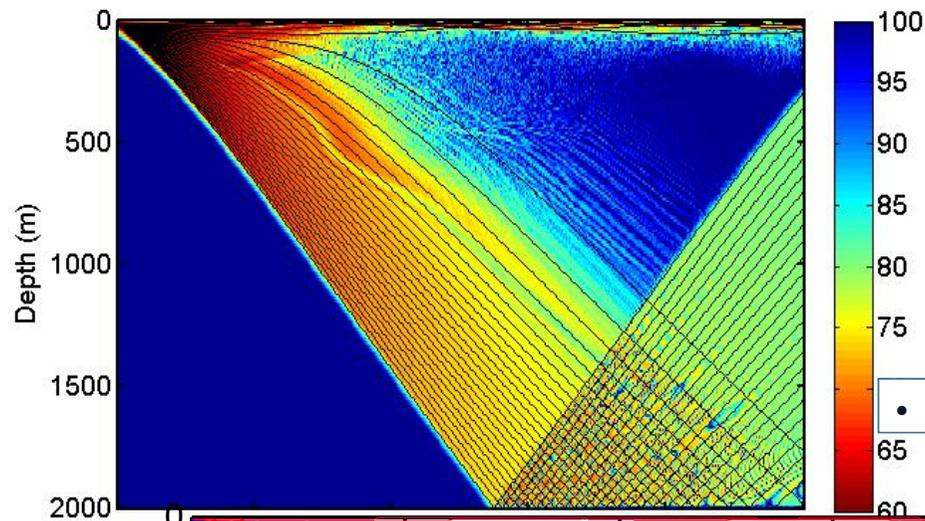
# 深水海域，表面(10米)與600米接受器隨距離變化圖

35 kHz



8 kHz

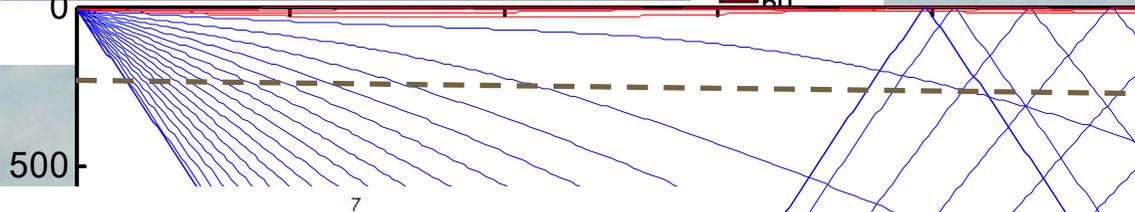




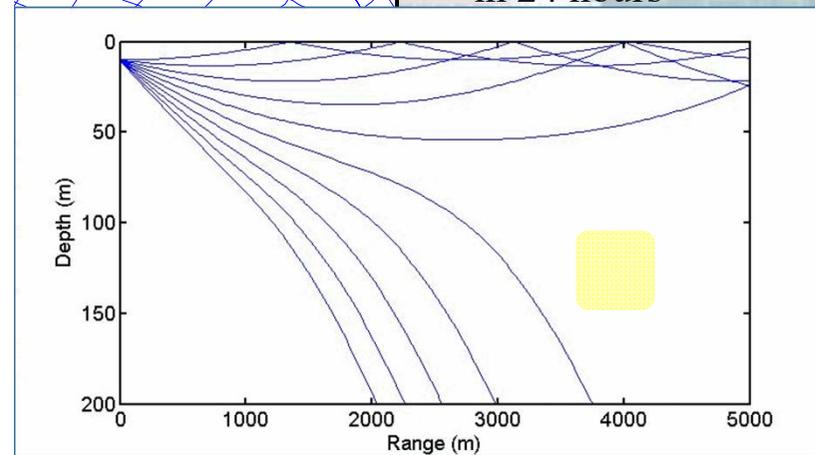
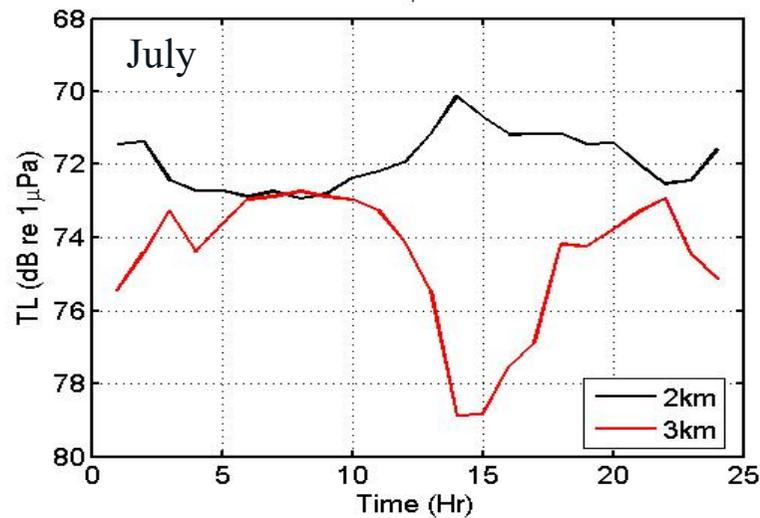
## 表面發聲器→底碇接受器

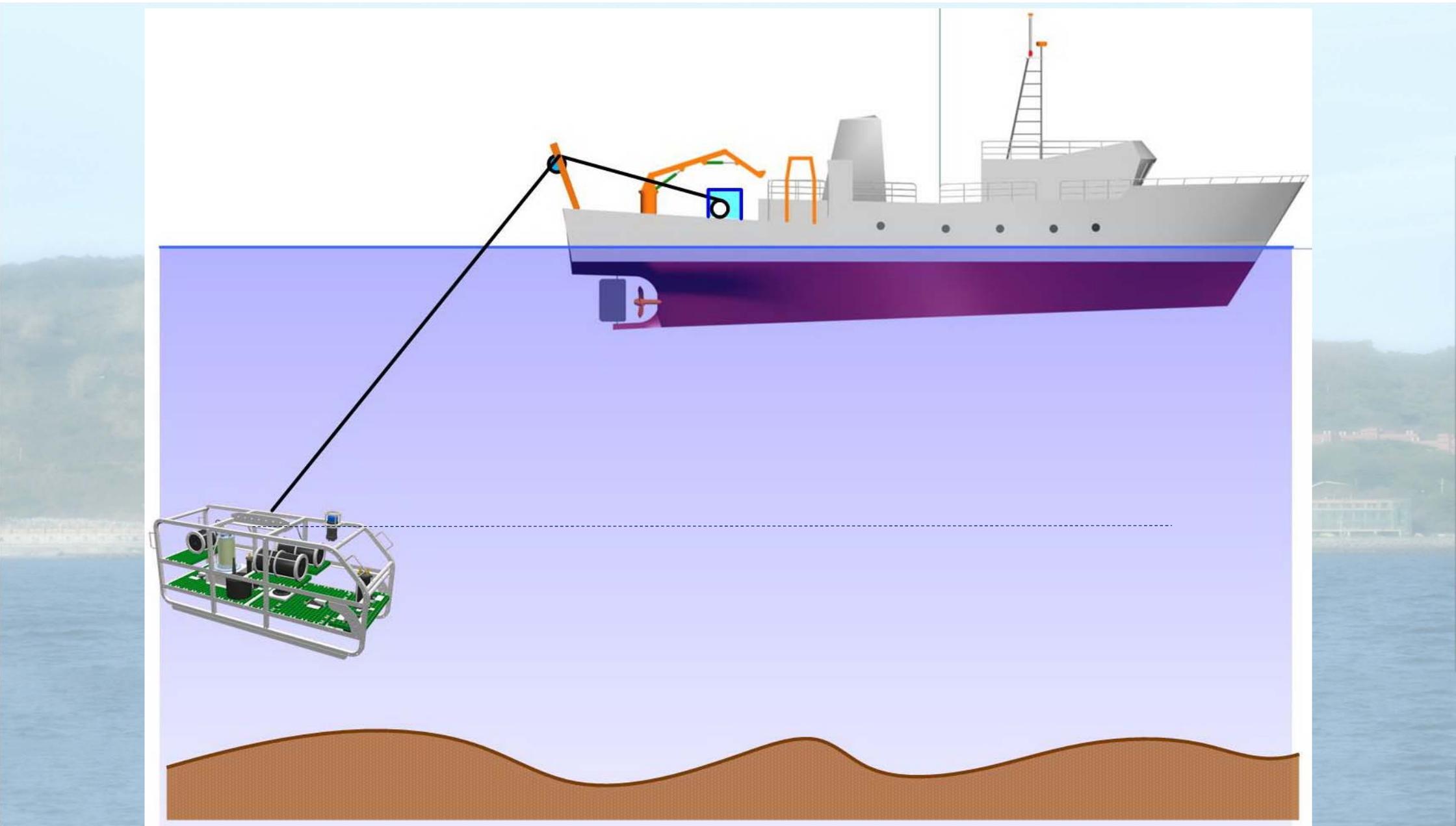
- 水文變動
  - Ocean Model (POM)
- 音傳能量差異
  - Surface duct, eddy, etc.

• 2000米水深的接受器，8小時內差異高達6dB



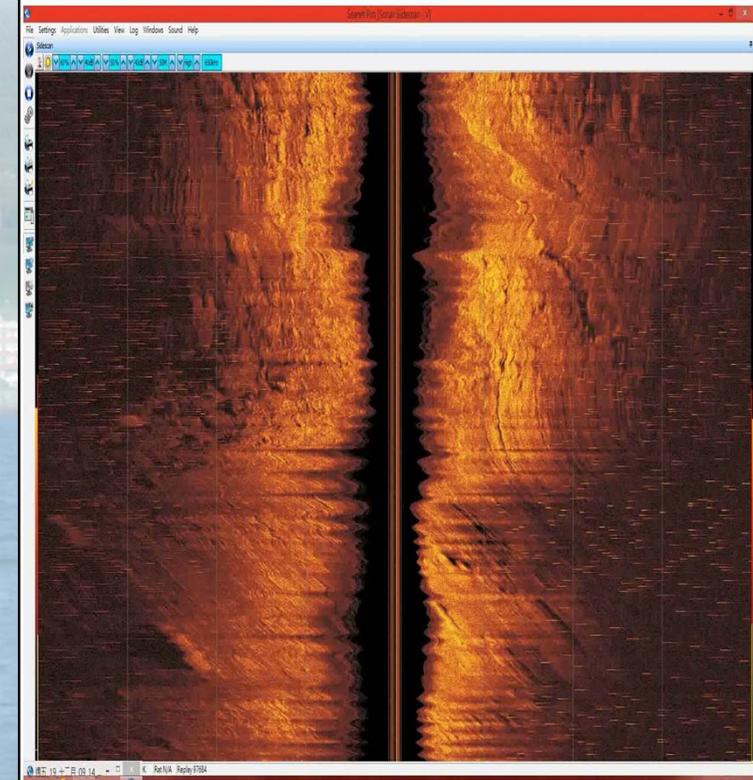
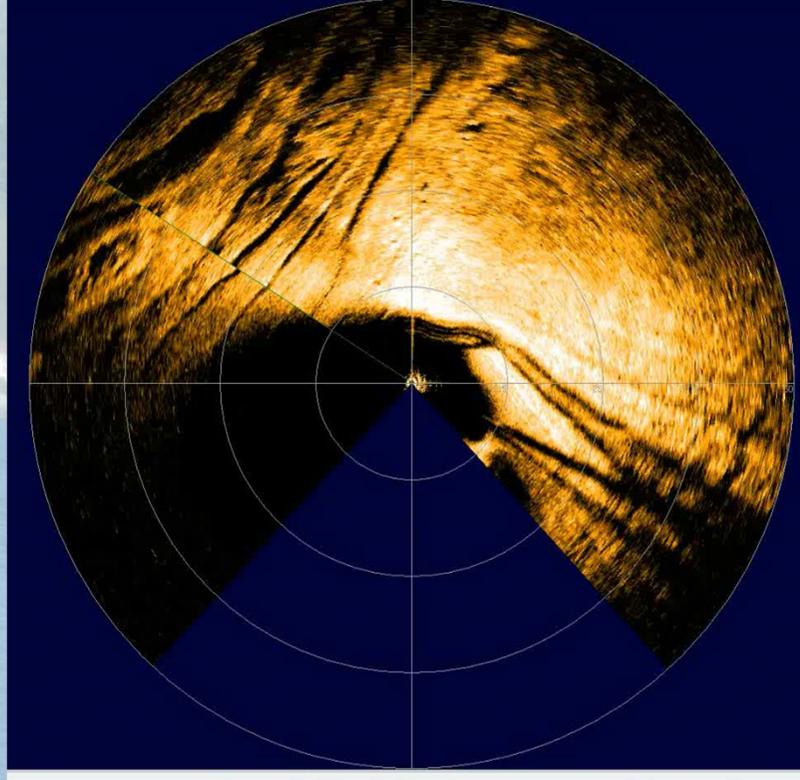
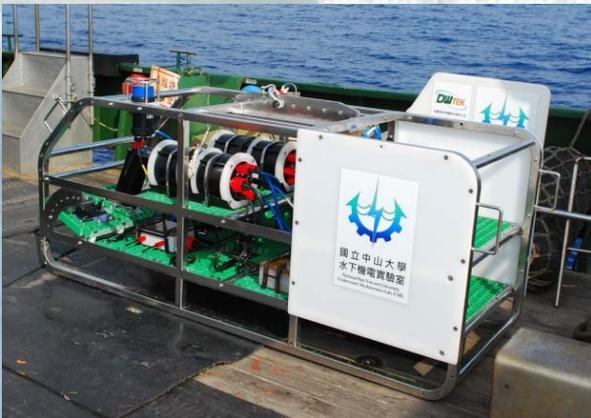
Ray path variation  
in 24 hours

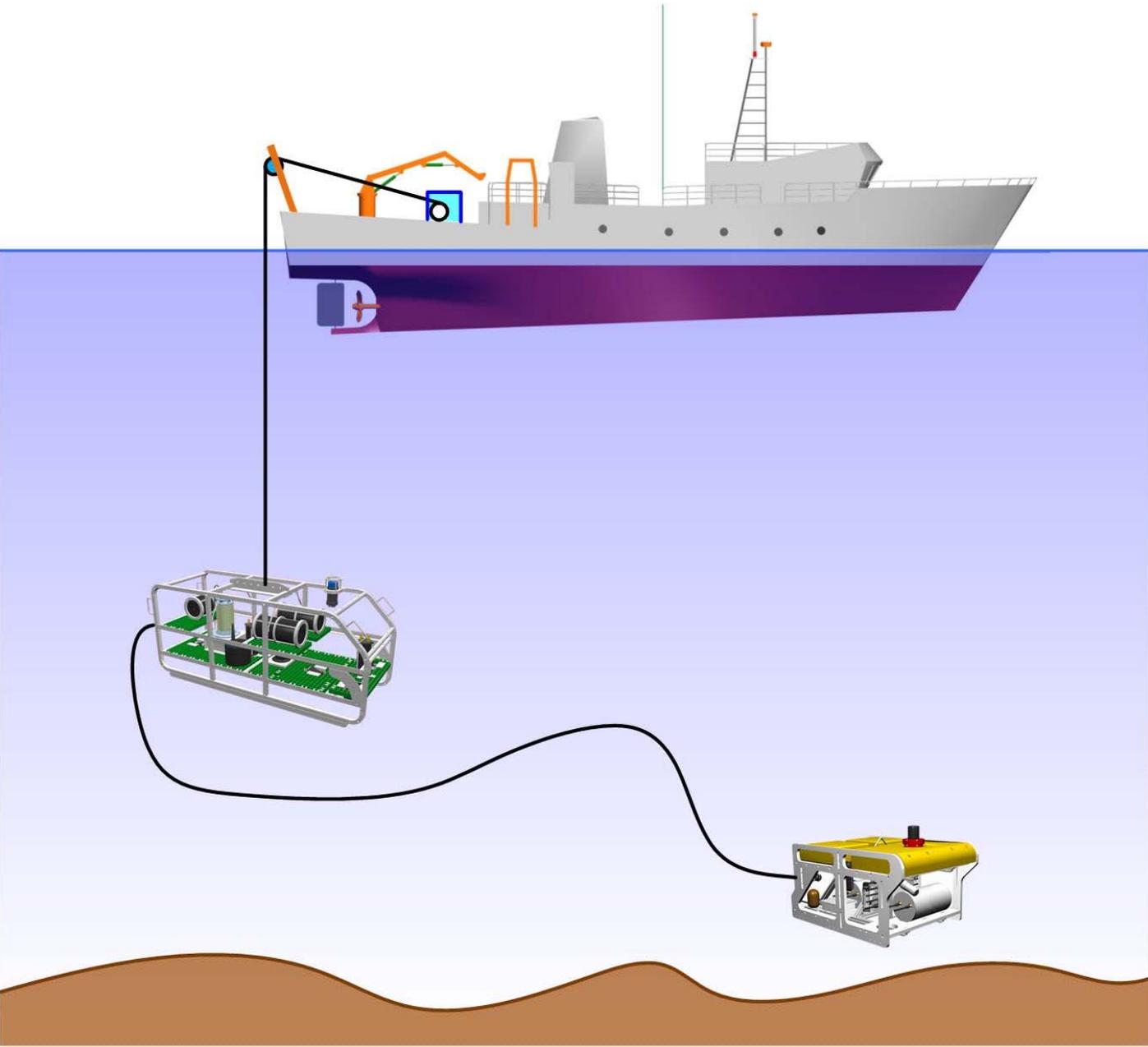




# 拖曳式即時影像導引儀器載台與定位系統開發

- 深海拖曳式光纖探測系統 FITS (Fiber-optical Instrumentation Towed System)
  - 搭配探測設備：前、俯視攝影機、高度深度計、環場聲納、SSS、DVL、INS。
  - 未來預計整合設備：USBL、底層剖面儀、電磁探測儀、拉曼光譜儀。





# 科研探測調查

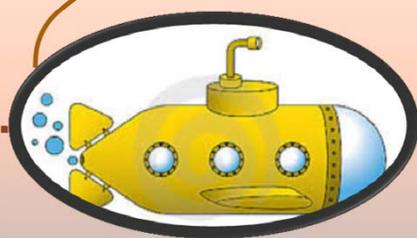


系統整合與測試  
(深度待定)

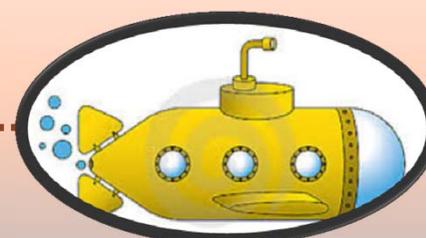
淺水珊瑚礁



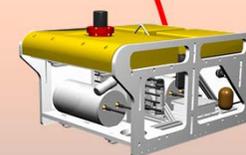
Phase I: 帶纜濕式載人載具



Phase II: 帶纜載人載具

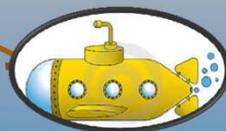


Phase III: 系統測試  
無確保纜



深海救援  
ROV (電力與  
通訊)

台灣海峽

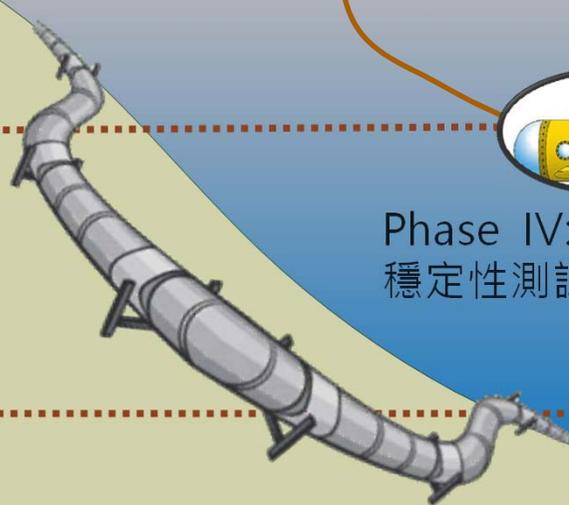


Phase IV: 系統獨立運作  
穩定性測試，有確保鋼纜

台灣西南海域



Phase V: 系統實海域運  
作性能測試，無確保鋼  
纜







敬請指教