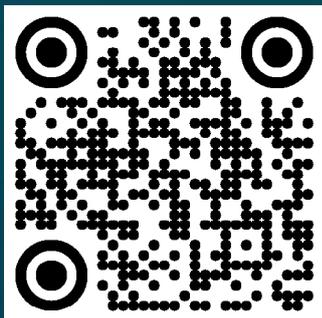# *Diving into the Remotely Operated Vehicles (ROV)*

"

台和 1 號　台灣製造
ROV Taihe No. 1
Made in Taiwan

知洋科技股份有限公司
Awareocean Technology Co., Ltd.

O4Ocean Message
海 誌

"

我不斷地思考海洋永續及科技創新。

I never stop thinking about ocean sustainability and technological innovation.

———

知洋科技公司總經理　湛翔智 博士
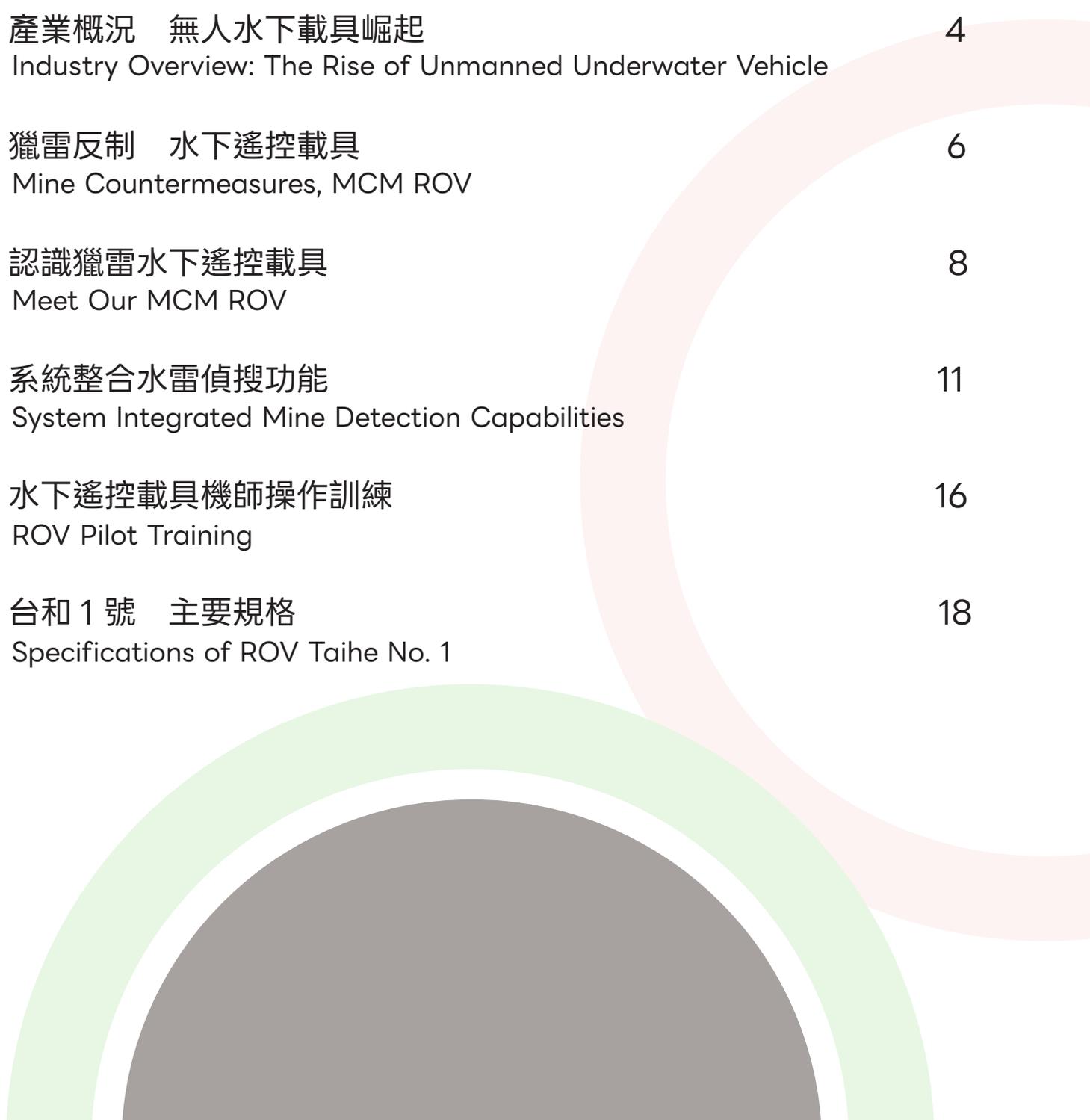
Hsiang-Chih CHAN, Ph.D.
President of Awareocean

湛博士在2015年創辦知洋科技股份有限公司，於2025年成立水下噪音協會並擔任理事長。

Dr. Chan founded Awareocean Technology Co., Ltd. in 2015 and established the Society of Underwater Noise in 2025, serving as its chairman.

Table of Contents

產業概況 無人水下載具崛起

Industry Overview The Rise of Unmanned Underwater Vehicle

"

全球無人水下載具市場規模將超越 103.2 億美元 (約3千億台幣)
$10.32 Bn Unmanned Underwater Vehicles Global Market Opportunities.

2024年，全球無人水下載具市場規模接近49億美元，自2019年以來複合年增長率（CAGR）為5.29%。預計該市場將從2024年的49億美元成長到2029年的72.3億美元，複合年增長率為8.09%。之後，預計該市場將從2029年起以7.38%的複合年增長率成長，並在2034年達到103.2億美元。

The global unmanned underwater vehicles market reached a value of nearly $4.9 billion in 2024, having grown at a compound annual growth rate (CAGR) of 5.29% since 2019. The market is expected to grow from $4.9 billion in 2024 to $7.23 billion in 2029 at a rate of 8.09%. The market is then expected to grow at a CAGR of 7.38% from 2029 and reach $10.32 billion in 2034.
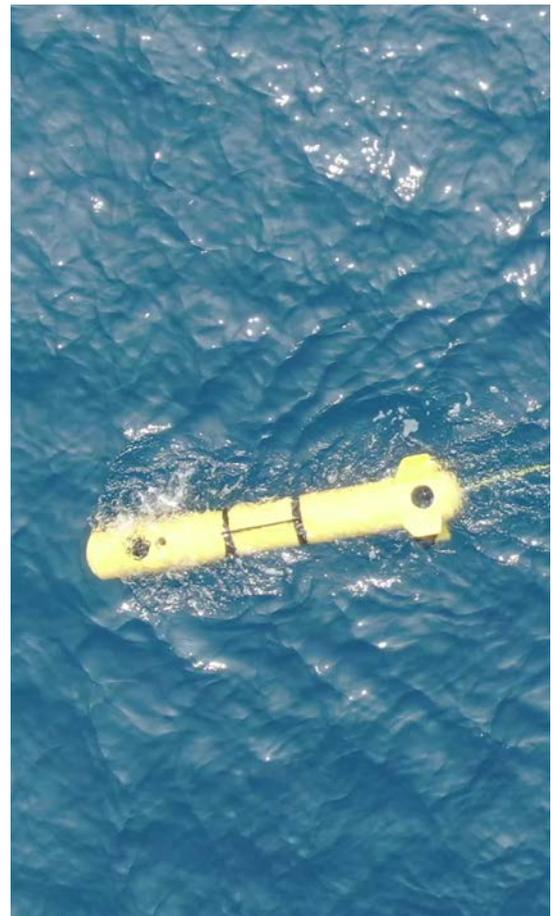
50k+
UUV Demands

$100bn+
UUV Market

為何擇用 ROV
Why Choose ROV

01

安全 Safety

可避免人員在危險環境作業，更適合在惡劣環境操作。
It avoids personnel working in dangerous environments and is more suitable for operation in harsh environments.

02

效率 Efficiency

由纜線即時傳回影像、聲納數據，專業人員分析決策效率提高。
By transmitting images and sonar data in real time via an umbilical cable, professionals can improve the efficiency of their analysis and decision-making.

03

功能 Functions

具備多裝備承載、通用操作、多樣化擴展等功能性，創造更大成本效益。
It possesses functions such as multi-equipment carrying capacity, universal operation, and diversified expansion, creating greater cost-effectiveness.

獵雷反制 水下遙控載具
Mine Countermeasures, MCM ROV

台和 1 號 Delphin

由知洋科技公司生產的「台和1號」，是一款軍用商規特殊作業型水下遙控載具，用於獵雷偵搜與反制。

The ROV Delphin (Taihe No. 1), manufactured by Awareocean Technology Co., Ltd, is a military-grade and commercial special-purpose product. It is used for mine hunting, detection, and countermeasures.

水雷是一種隱密高、成本低、威力大的水中兵器，在敵方水域或航道布設後，可阻滯、遲滯、摧毀敵方水面艦艇和登陸部隊的非對稱作戰手段。

Mines are a type of underwater weapon that is highly stealthy, low-cost, and powerful. Once deployed in enemy waters or waterways, they can hinder, delay, and destroy enemy surface ships and landing forces - an asymmetric warfare tactic.

台和－象徵台海和平。

Taihe – It is symbolizing peace across the Taiwan Strait.

模組功能
Modular Functions

同款三型具備獵雷全功能
Full Functions MCM ROV in Three Modules.

產品優勢 Product Advantages

水下遙控載具擁有高效傳輸能力、即時定位功能，並支援任務模組快速更換與遠端操作。

The ROV features high-capacity data transmission, real-time positioning, and rapid mission module interchangeability, all operable remotely.

"

全球首款 The World's First

台和1號水下遙控載具從研發階段開始，就專注於解決獵雷作戰的需求與方法。三型載具採用相同尺寸載具，因應任務而搭配各種裝備。

From the development stage, ROV Taihe No. 1 has focused on addressing the needs and methods of MCM operations. The three modules use the same dimensions vehicle, with various equipment added according to the mission requirements.
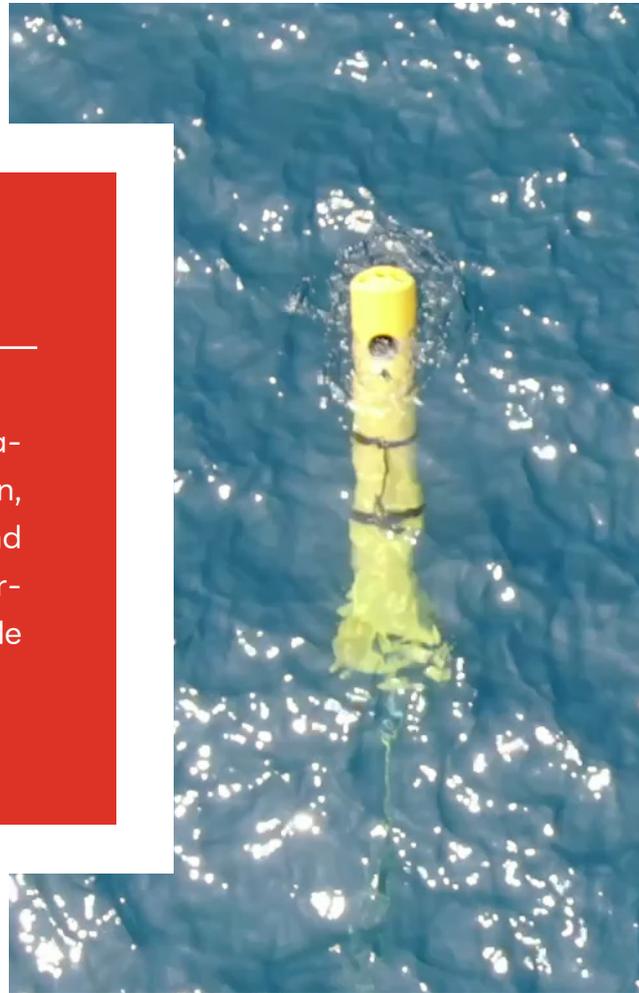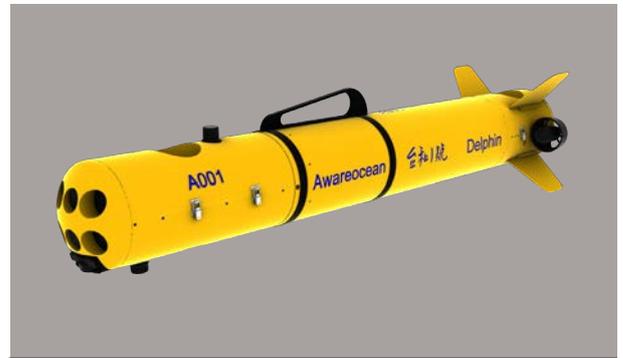
認識 獵雷水下遙控載具
Meet Our MCM ROV

偵搜型 Module A

配置前視成像聲納及攝影機,用於偵搜繫流雷。

Equipped with forward imaging sonar and cameras for detecting mooring mines.

旗艦型 Module F

裝配側掃聲納,用於偵測沉底雷,提升搜索效率。

Equipped with side-scan sonar for detecting bottom mines, improving search efficiency.

反制型 Module B

將後推進器空間改裝為可裝填炸藥及聲學遙控引信,有效清除雷區。

The stern thruster space is modified to accommodate explosives and acoustic remote-controlled fuses, effectively clearing minefields.
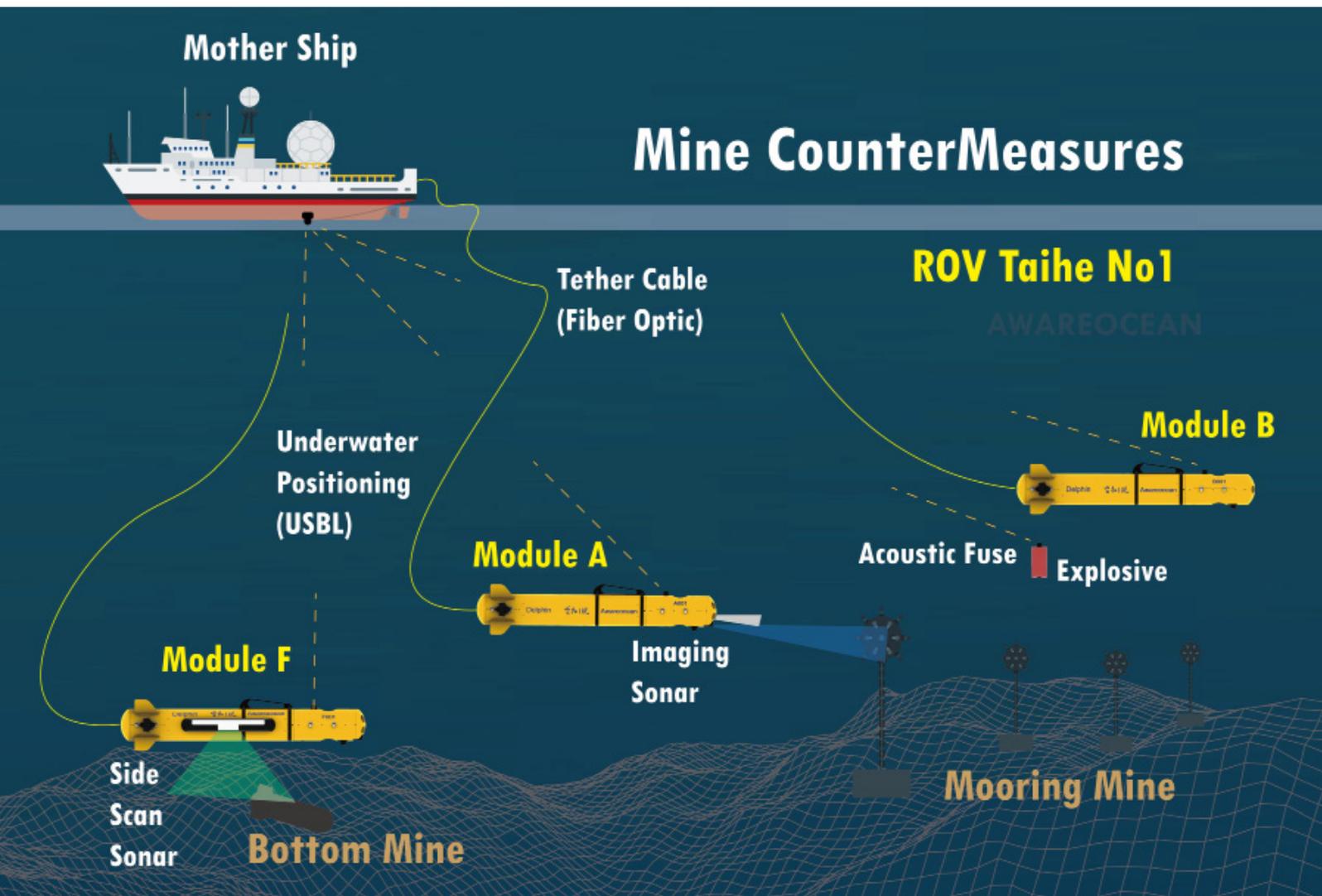
快速偵搜反制水雷
MCM ROV Rapid detection and Countermeasures

台和１號具備現代化獵雷作業能力，在完成水雷定位後，可派遣攜帶炸藥的水下遙控載具前往引爆。

Taihe No. 1 is equipped with modern MCM capabilities. After locating the mines, it can dispatch an ROV carrying explosives to detonate them.

系統架構
System Scheme

台和１號採用模組化的系統架構，由載具控制系統(RCS)、光纖通訊、水面上控制、載具電池供電等四大核心組成，水下遙控載具的所有控制權皆掌握在水面上，具備高度操作安全性。

Taihe No.1 adopts a modular system scheme, consisting of four core components: ROV control system (RCS), fiber optic communication, surface control, and vehicle battery power supply. All control of the ROV is maintained on the surface, ensuring a high level of operational safety.

光纖通訊
Fiber-optic Communication

為了減少臍纜的重量與阻力，台和１號使用單芯單模(Single Mode, SM)光纖線，光纖內外徑為9/125　微米(um)。臍纜包覆材料可抵抗水壓與產生浮力特性，實際外徑不超過6公厘。

利用多波段分工技術（WDM）的技術，實現大容量、低干擾的雙向資料傳輸。透過光電轉換器，控制指令、水中影像、聲納及感測數據皆能穩定傳輸，即使在海況較差的情況下仍保持不中斷。
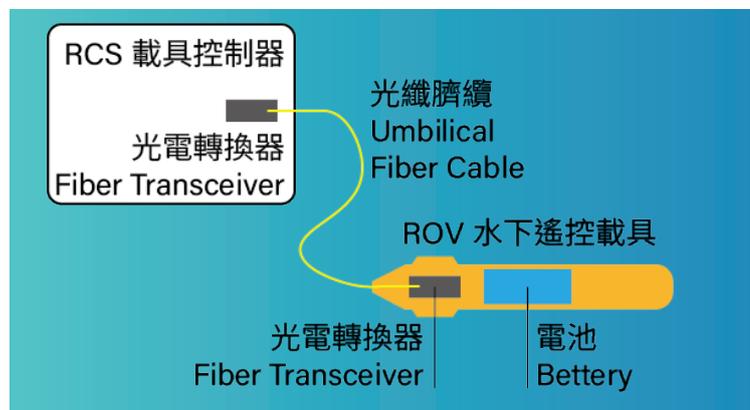
To reduce the weight and drag of the umbilical cable, Taihe No. 1 uses single-mode (SM) optical fiber with an inner and outer diameter of 9/125 um. The cable sheathing material is resistant to water pressure and provides buoyancy, with an actual outer diameter not exceeding 6 mm.

By utilizing multi-band division multiplexing (WDM) technology, high-capacity, low-interference bidirectional data transmission is achieved. Through photoelectric converters, control commands, underwater images, sonar, and sensor data can all be transmitted stably without interruption, even in rough sea conditions.

系統整合 水雷偵搜功能
System Integrated Mine Detection Capabilities

聲納－偵測、導航、定位
SONAR for Detection, Navigation and Positioning.

USBL Beacon (Positioning)

A001

Scanning Sonar

Forward Imaging Sonar


Forward Imaging Sonar

聲納顯示水雷偵測座標
Sonar Displays Mine Detection Coordinate Information

聲納系統顯示偵測距離與方位角(圓柱座標系統)，由水下定位系統ROV位置，轉換直角座標系統顯示水雷位置經緯度。

The sonar system displays the detection ranges and bearings (cylindrical coordinates), while the ROV position (USBL) is converted to rectangular coordinates to display the longitude (X) and latitude (Y) of the mine location.

Range: 14.42m Bearing: 49.20°　　X:　120.37254E Y:　22.33027N

Scanning Sonar
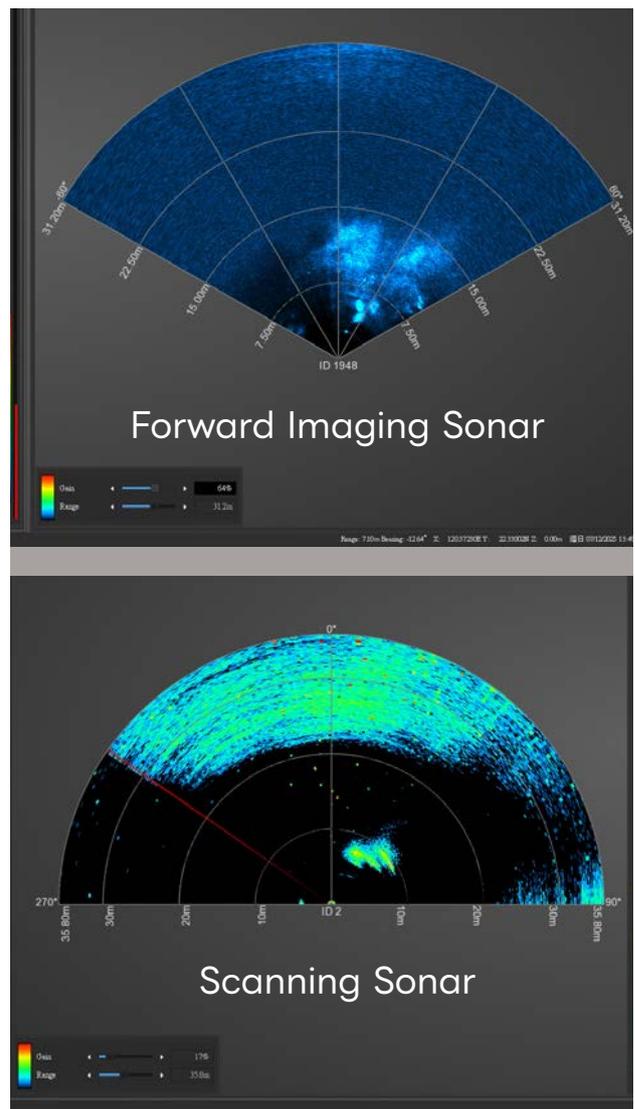
水下遙控載具導航
ROV Navigation

台和 1 號具有優異的水下導航功能
Excellent underwater navigation capabilities in ROV Taihe No.1

● **定位 Positioning**

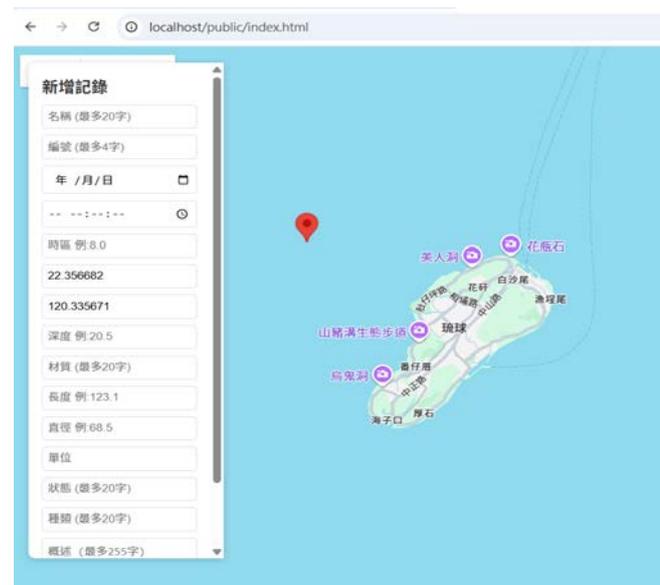水下聲波超短基線定位系統 ｜ Underwater Acoustic Ultra-short Baseline (USBL) Positioning System

● **深度 Depth**

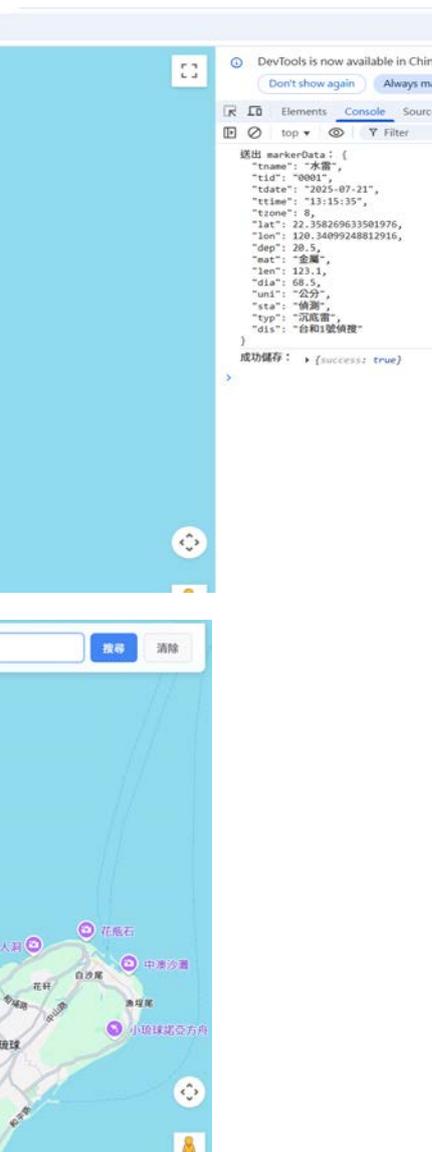深度計從水壓數據轉換 ｜ Water pressure data to water depth meter

● **高程 Altimeter**

高程計從單音束測深數據 ｜ Altimeter data from single-beam echosounding

● **艏向 Heading**

航姿參考系統的電羅經數據 ｜ E-compass data from Attitude and Heading Reference System (AHRS)

送出 markerData: {
  "tname": "水雷",
  "tid": "00001",
  "tdate": "2025-07-21",
  "ttime": "13:15:35",
  "tzone": 8,
  "lat": 22.358269633501976,
  "lon": 120.34099248812916,
  "dep": 20.5,
  "mat": "金屬",
  "len": 123.1,
  "dia": 68.5,
  "uni": "公分",
  "sta": "偵測",
  "typ": "沉底雷",
  "dis": "台和1號偵搜"
}
成功儲存: ▸ {success: true}

● **海洋作業決策圖資系統 MOWIS**

Marine Operation Windows Information System

水雷反制作業軟體功能
MCM Software's Functions

1. 與台和 1 號導航數據連線

   Connecting with ROV Taihe No.1's navigation system.

2. ROV搜索路徑顯示與紀錄

   ROV search path display and recording.

3. 海洋圖台系統可更換海圖

   Maritime chart system within different charts.

4. 海氣象預報數據圖像顯示

   Marine weather forecast data image display.

5. 海上安全作業氣象窗設定

   Marine safety operation weather window settings.

6. 水雷資料庫 (影像、聲納)

   Mine database (images, sonar).

7. 顯示水雷位置與更新狀態

   Display of mine locations and update status.

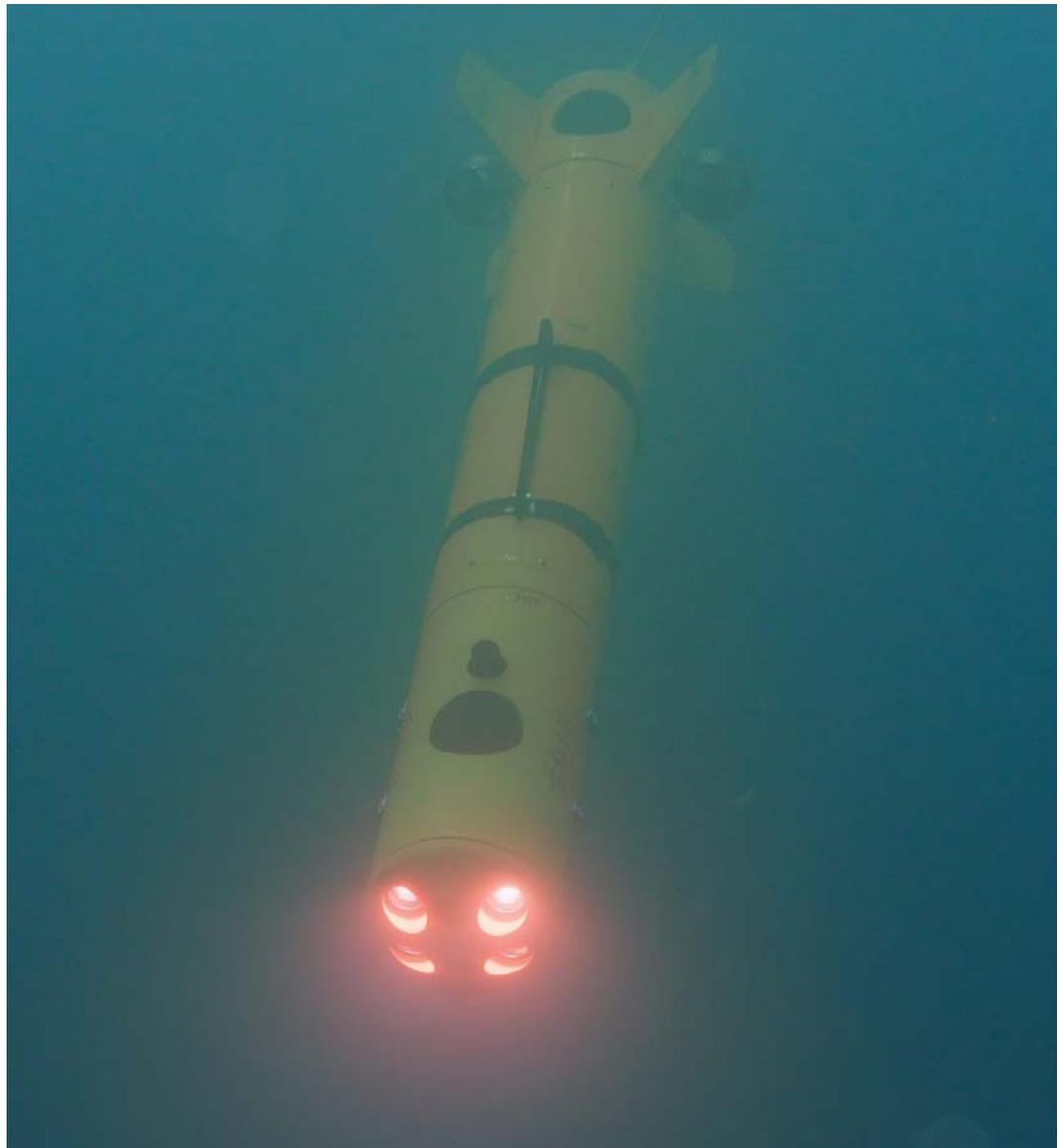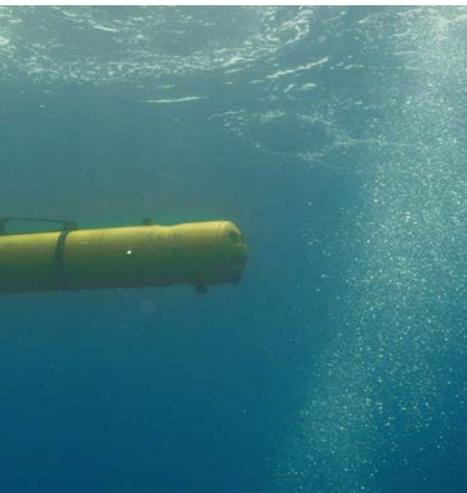# 實海操作照片
Sea Trial Photos
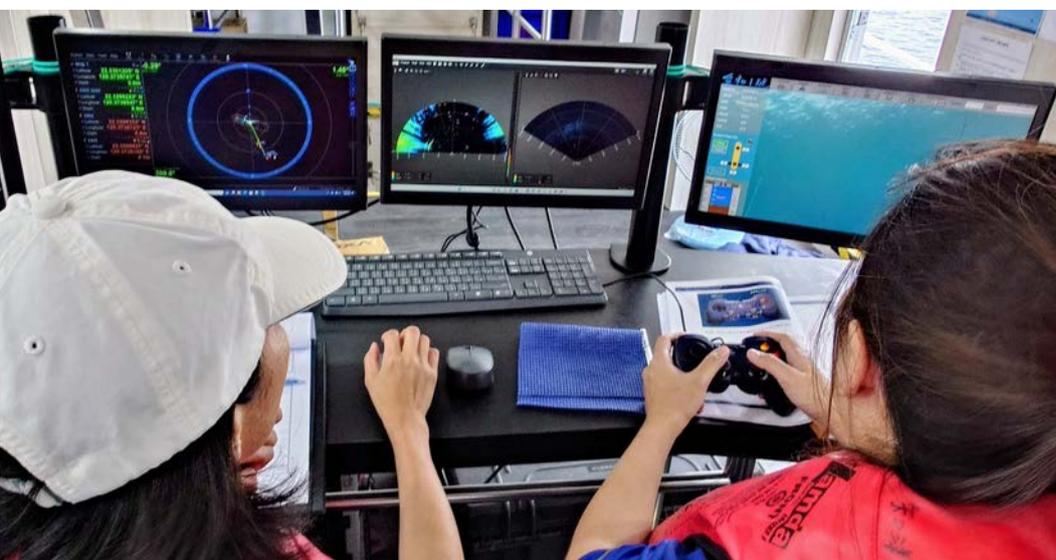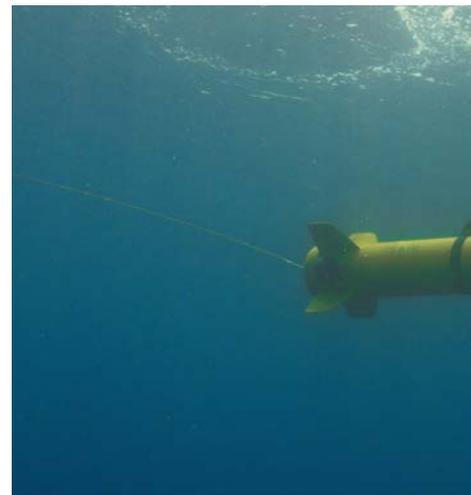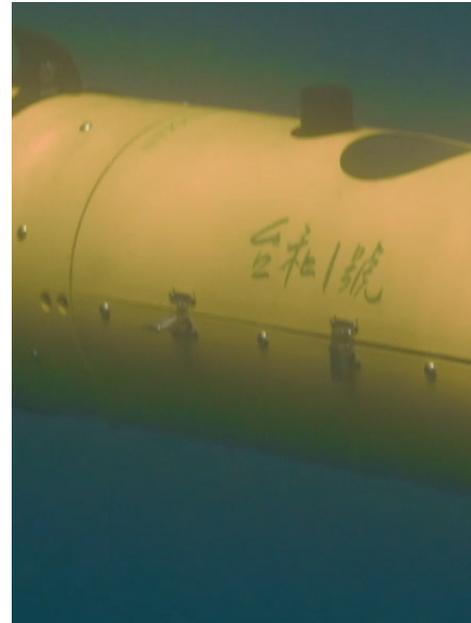
水雷反制

有2種方式炸毀水雷
There are two ways to destroy mines.

1. ROV釋放炸藥

   ROV releases explosives.
2. ROV直接引爆

   ROV detonates directly.

作業程序 MCM Procedures

A
偵搜及定位水雷
Detected and Localized Mine

Module A

B1
炸藥引爆
Explosive Detonation
回收 ROV Retrieved

釋放炸藥
Exposives
Released

Module B

B2
直接引爆
Direct Detonation

犧牲 ROV Destroyed

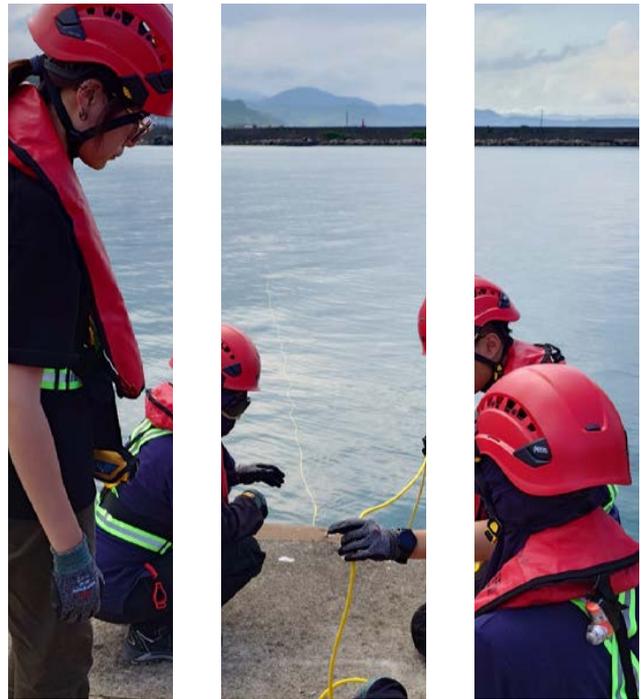Module B

水下遙控載具機師操作訓練
ROV Pilot Training
Safe Diving & Operating

40小時基本訓練
Basic Training in 40 Hours

含8小時學理概論、8小時操作訓練、16小時實際操作設備及8小時維護保養檢修。
Including 8 hours of theoretical intro-duction, 8 hours of operation training, 16 hours of actual equipment operation and 8 hours of maintenance and repair

水下遙控載具概論
ROV Introduction
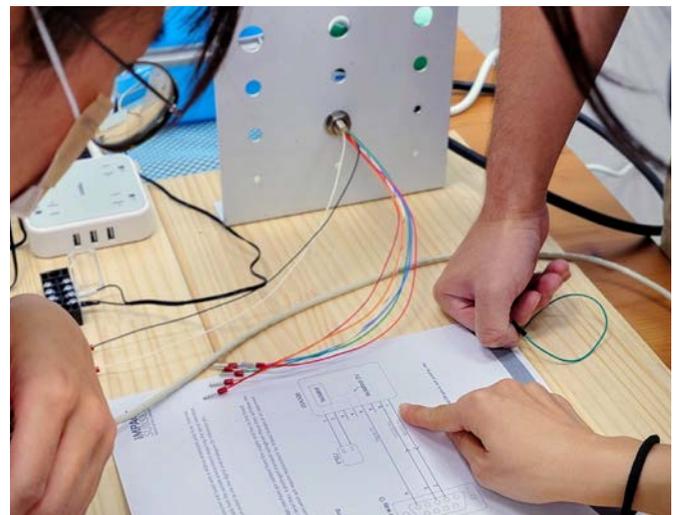
水下遙控載具種類與用途、作業文件與環境介紹、操作安全要求及流程
Types and uses of ROV, operation documents and environment introduction, operation safety requirements and procedures.

水下遙控載具操作
ROV Operation Learning

水下遙控載具電力、通訊、臍纜、裝備、工具、運動控制之原理與操作
Principles and operation of ROV to power, communications, umbilical cables, equipment, tools, and motion control.

水下遙控載具操作實習
ROV Operation Practice

水下遙控載具布放及回收、航行運動控制、攝影機與聲納操作

ROV deployment and recovery, navigation motion control, camera and sonar operation.

水下遙控載具維保修
ROV Maintenance & Repair

水下遙控載具使用後維護與保養、各項零組件檢查與更換維修

Maintenance and upkeep of ROV after using, inspection and replacement of ROV components.
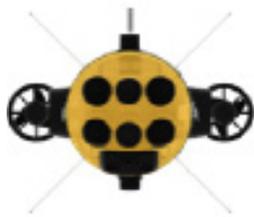
台和 1 號　主要規格
Specifications of ROV Taihe No.1

操作水深	Operating Depth	300 meter
外型尺寸	Dimension (LxWxH)	2300 x 700 x 700 mm
空氣中重量	Weight in Air	100 kg
水下推進器	Propulsion	Horizontal/Vertical 2/2 x 1 kW
航行速度	Cruise Speed	Forward Max 6 knots (3 m/s)
最大推力	Max Thrust	Forward/Dive 32/16 kgf
水下攝影機	Underwater Camera	IP Camera 2 x FHD & ≧ 25 fps
水下燈光	Underwater Light	LED > 4,000 lm
電力供應	Electrical Power	Total 3 kW in 48 VDC; 48/24/12/5 VDC
操作時間	Operating Duration	2 Hours (Average speeds in 3 knots)
通訊系統	Communication System	Fiber Single Mode/Ethernet < 20 km
臍纜通訊	Umbilical Communication	SPE Converter/Ethernet < 1 km
臍纜規格	Umbilical Cable	1,000 m; 1 FO-SM; OD 6 mm
		1,000 m; 2C x AWG 18; OD 7 mm
水下定位	Underwater Positioning	USBL Range in 995 m; Depth 500 m
掃描聲納	Scanning Sonar	700 kHz; Range in 75 m
成像聲納	Imaging Sonar	1200/720 kHz; Range in 50/120 m
感測器	Sensors	Depth in 500 m; Altimeter in 120 m
		AHRS

各型裝備配置 Equipment Configuration	偵搜型 Module A	旗艦型 Module F	反制型 Module B
水平推進器 Horizontal Thrusters	●	●	●
前垂直推進器 Forward Vertical Thrusters	●	●	●
後垂直推進器 Aft Vertical Thrusters	●	●	●
水下攝影機及燈光(平視) Camera & Lights (Forward)	●	●	●
水下攝影機及燈光(俯視) Camera & Lights (Downward)	●	●	
水下定位應答器 USBL Beacon	●	●	●
感測器 (深度計/高程計/AHRS) Sensors (Depth/Altimeter/AHRS)	●	●	●
掃描聲納 Scanning Sonar	●	●	●
成像聲納 Imaging Sonar	●	●	
側掃聲納 Side Scanning Sonar		●	
炸藥及聲學引信 Explosives & Acoustic Fuse			●

偵搜型 Module A

水下定位應答器
USBL Beacon

攝影機
Camera

水下燈
Light

深度計
Depth Meter

高程計
Altimeter

推進器
Thruster

旗艦型 Module F

成像聲納
Imaging Sonar

掃描聲納
Scanning Sonar

側掃聲納
Side Scanning Sonar

反制型 Module B

聲學引信
Acoustic Fuse

反制炸藥
Counter Explosives

如有任何水下遙控載具或海洋設備需求，歡迎與我們聯繫。
Contact us, if you have any demand on ROV and Ocean Equipment.

www.awareocean.com
service@awareocean.com
+886 2 2908 2150
+886 2 2908 2151

242051　新北市新莊區中正路657-2號3樓
3F., No.657-2, Zhongzheng Rd., Xinzhuang Dist.,
New Taipei City (242051), Taiwan, R.O.C.