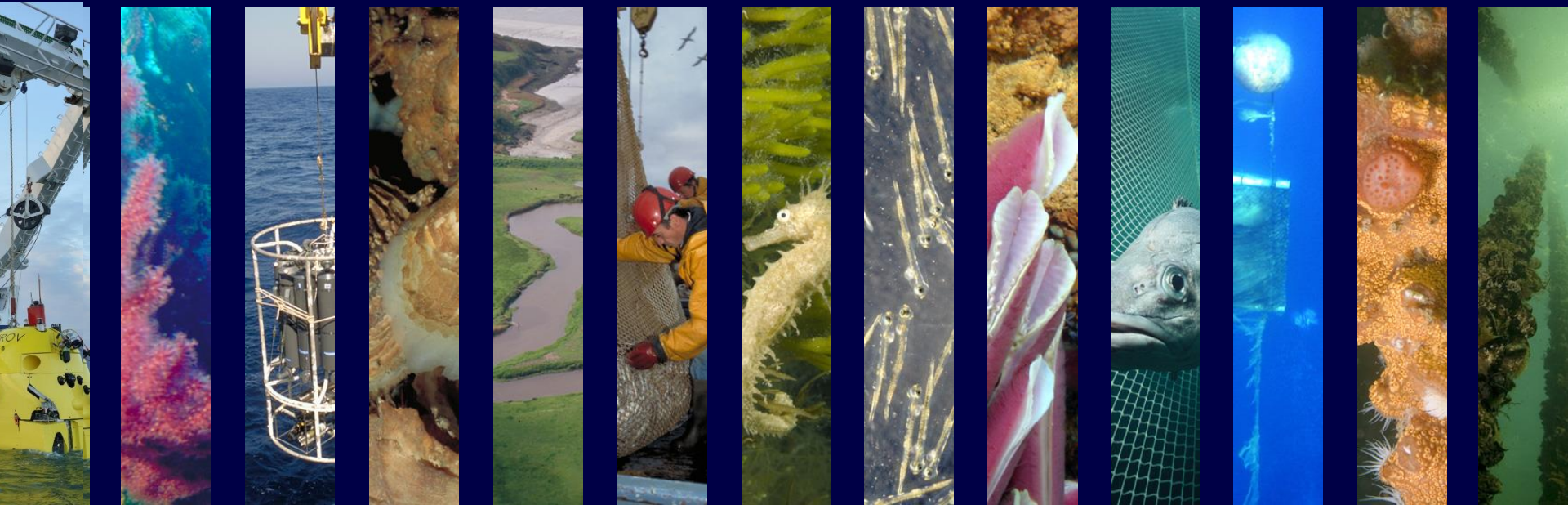


Hybrid ROV Ariane

An innovative vehicle for coastal operation

Ewen Raugel, Underwater Systems Unit

October 2017

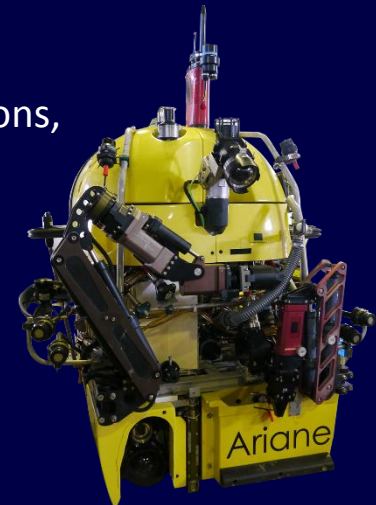


HROV Ariane, an innovative vehicle for coastal operation

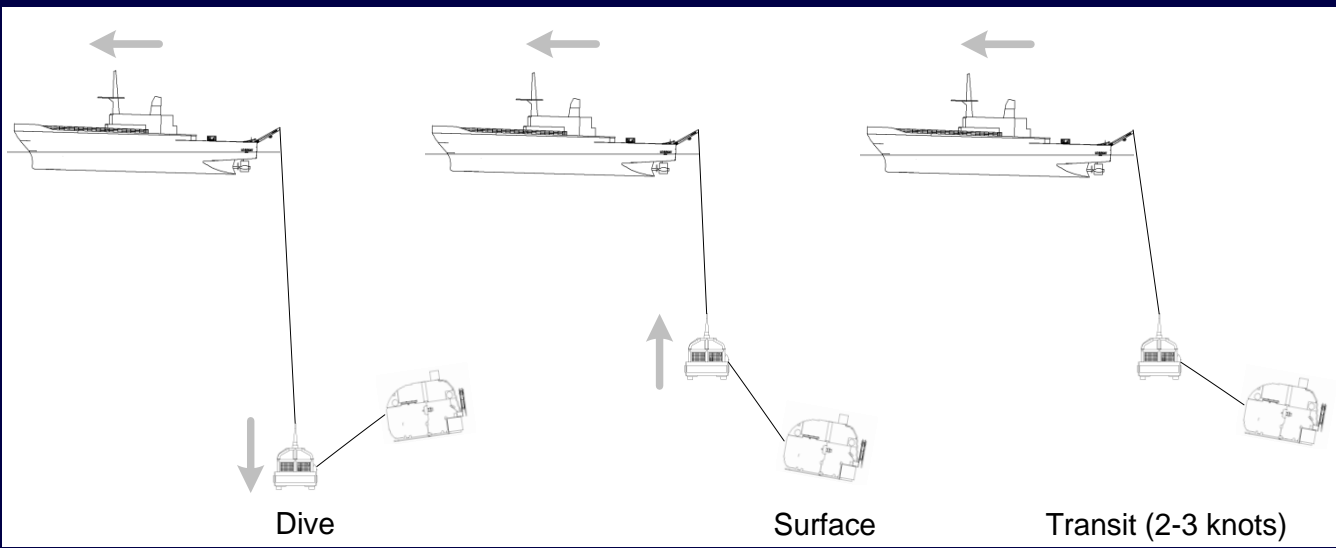
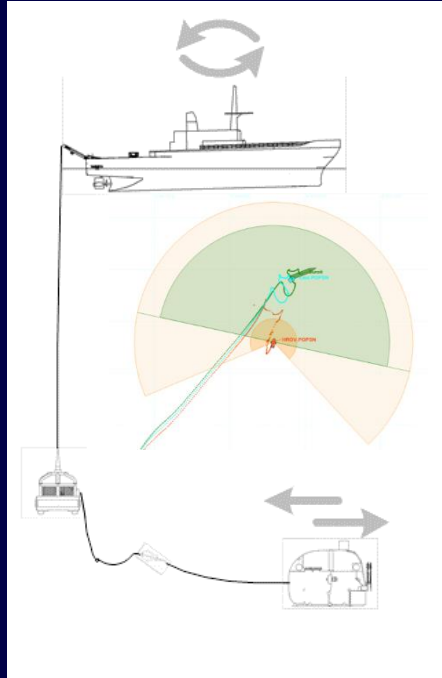
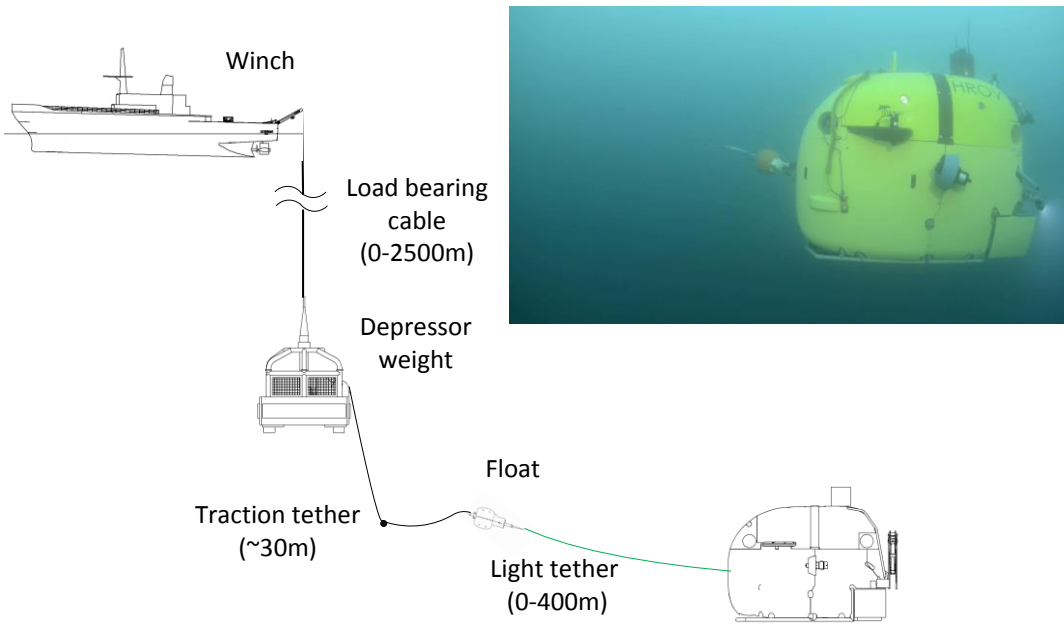
- ❖ An new hybrid ROV concept with a reversible fiber optic management allowing operation from a non Dynamic Positioning capable light vessel
 - ➔ Reduced operational cost
 - ➔ Easy and cost-effective access to ship time (opportunity vessels)



- ❖ Autonomy limited by onboard battery : daily work cycle
- ❖ Perform tasks on all sorts of seabed morphology, emphasis on canyons, cliffs and steep inclines, up to 2500m depth
- ❖ 2 payload configurations :
 - ✓ *Exploration, intervention and sampling* configuration
 - ✓ *Optic and acoustic cartography* configuration



HROV Ariane Concept



HROV Ariane : technical features



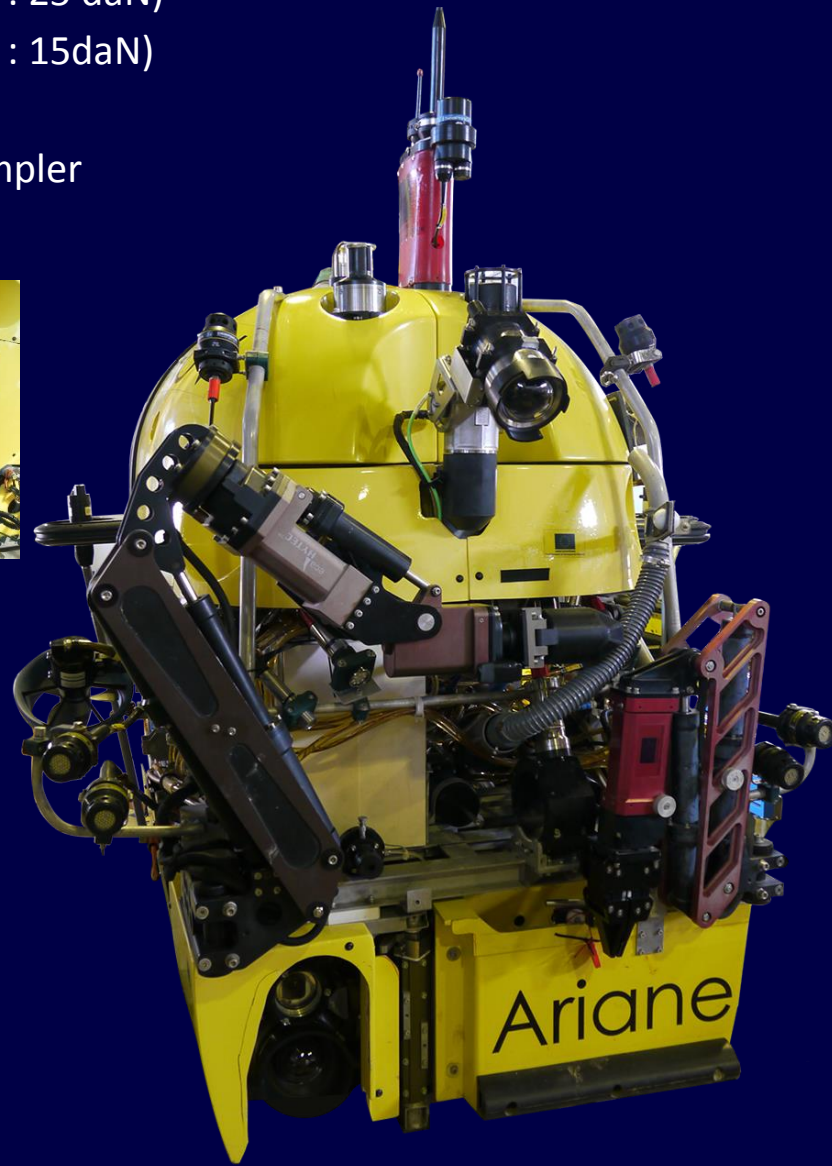
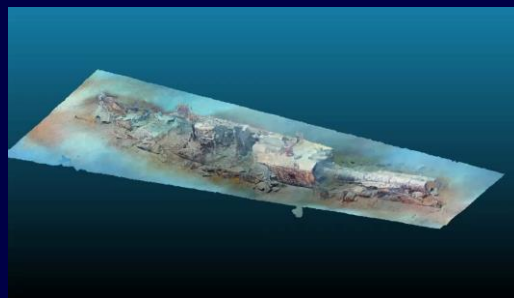
Features	
Weight	1,8 tons with payload ~220kg
Size	2800*1850*2130 mm ³
Depth	Up to 2500m
Speed	0-2 knot
Autonomy	4 – 8h

Equipments	
Sensors / navigation	Inertial unit(PHINS III) Depth sensor (Paro) vertical and frontal DVLs (600KHz) CTD (SBE49, Sea-Bird Electronics)
Positioning	GAPS / USBL-box
Communication	ROV : optical fiber AUV : acoustic modem
Optical devices	Main Pan&tilt HD camera 3 auxiliary cameras (PAL) Scanning Sonar 360°/100m
Energy	13kWh@150V Li-ion battery + 6kWh@48V Li-ion battery
Safety devices	Drop weight (29.4 daN) Fiber cutter
Thrusters	Main propulsion : 2 tilting thrusters 2 vertical auxiliary thrusters 2 lateral auxiliary thrusters 18 liter reversible ballast

Exploration & sampling configuration

Payloads :

- ✓ 7 function electric manipulator (capacity : 25 daN)
- ✓ 5 function electric manipulator (capacity : 15daN)
- ✓ Sampling tools bay (105 litres)
- ✓ Faunal specimen sampler / sediment sampler
- ✓ Tilting digital still camera

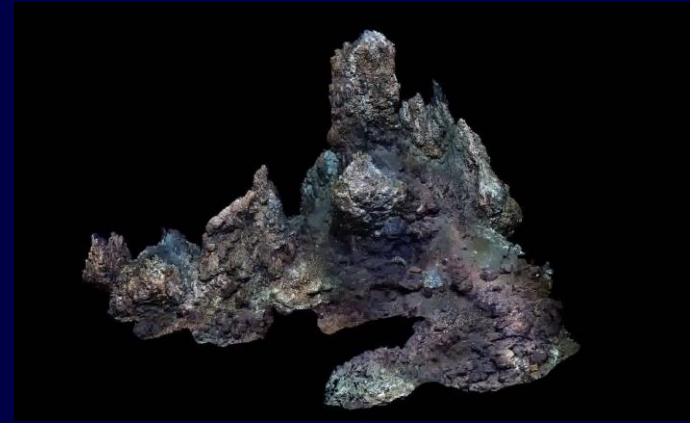


Cartography configuration

Payloads :

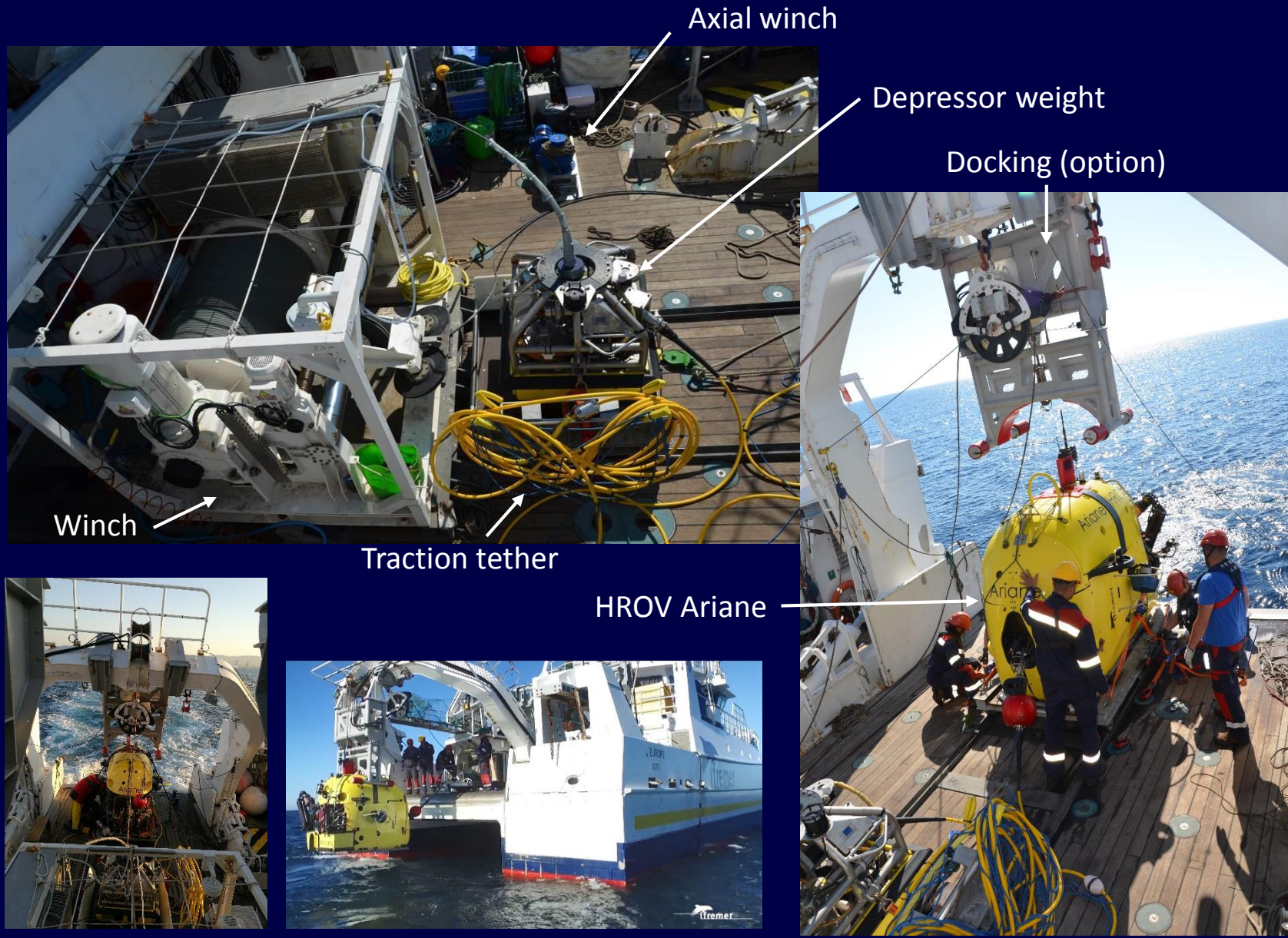
- ✓ EM2040 multibeam echosounder (Kongsberg)
 - ➔ Adjustable angle of transducers : $0^{\circ}/45^{\circ}/90^{\circ}$
- ✓ Tilting digital still camera with associated flash

Sea tests planned in november 2017



Nominal deployment (N/O L'Europe)

→ Up to 2500m depth



Shallow water deployment (N/O Côte de la Manche)

→ Up to 400m depth



Docking (option)

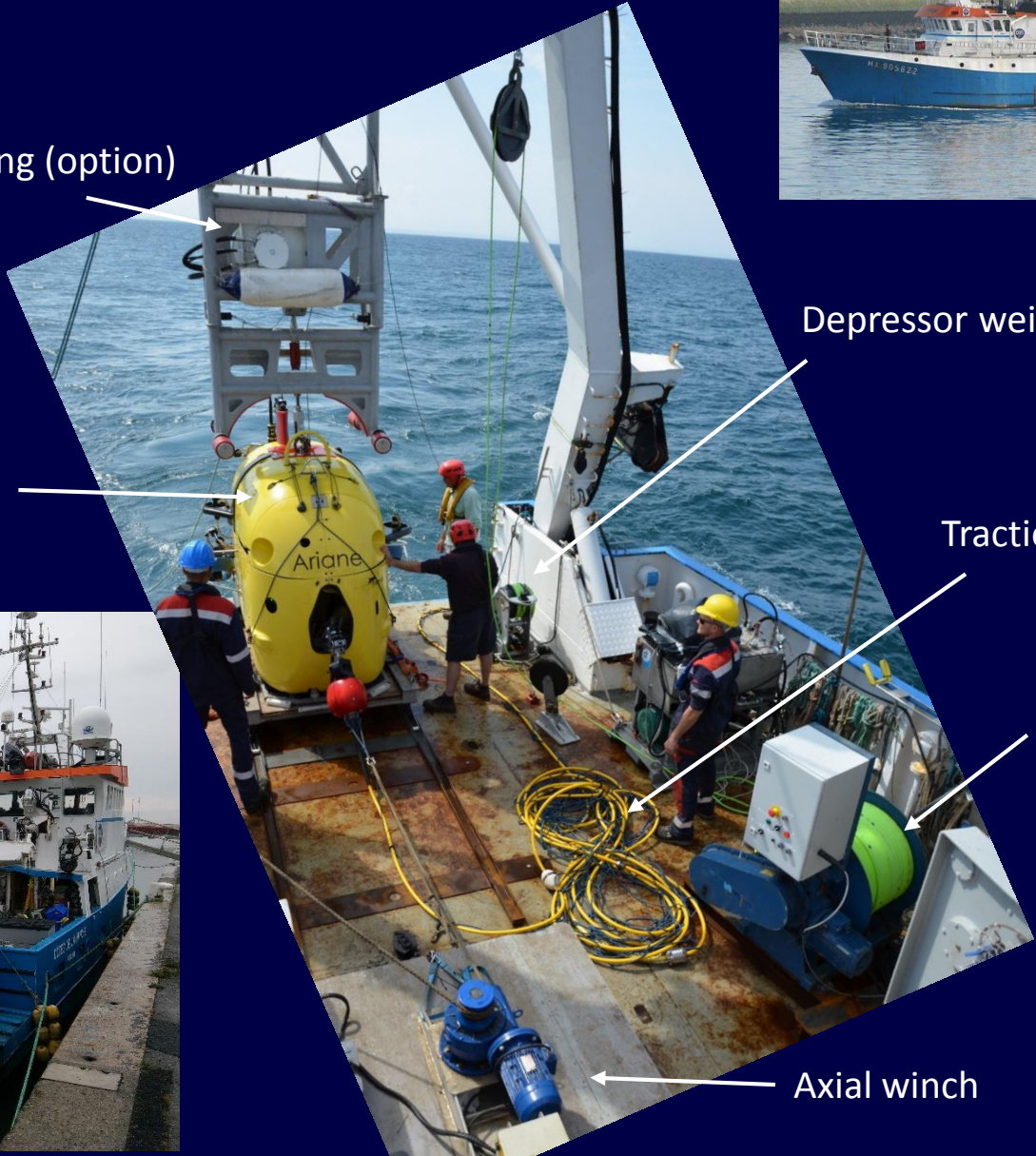
HROV Ariane

Depressor weight

Traction tether

Winch

Axial winch



HROV Control desk



Co-pilot

Pilot



Scientist

Computer racks



Battery chargers



Dive organization

- Check list : 2h
- HROV launch: 20min
- Diving (docked HROV) ~ 0,6m/s
- At working depth : weight ajustment, vessel stabilization, HROV undocking (light fiber deployment), approach and start of works
- Duration of works limited by onboard bzttery around 3 to 6 hours
- Surfacing (docked HROV) ~ 0,6m/s
- HROV recovery : 20 min

Dive exemple : Meust (2500m)

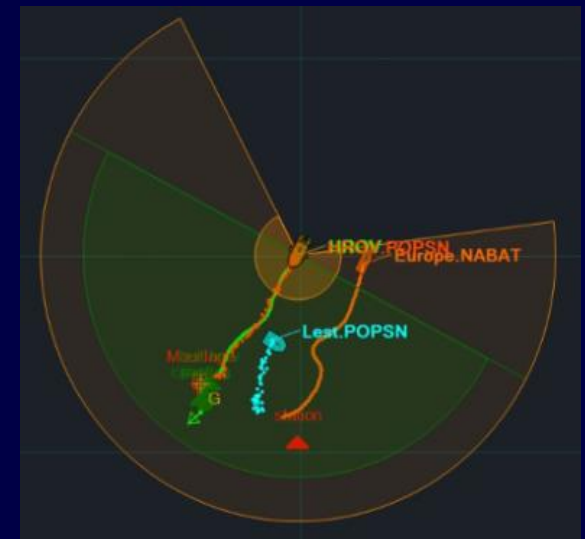
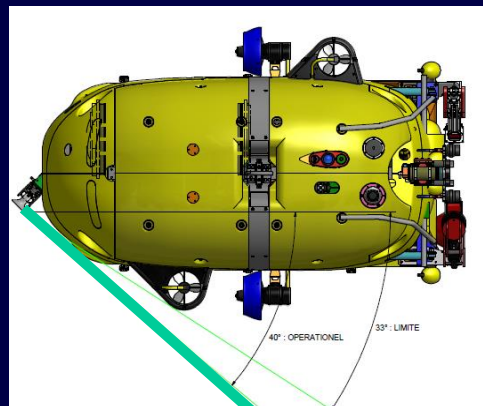
10h35	HROV launch
11h00	Start of diving
12h30	HROV undocking
12h45	Start of works on Meust site
15h50	End of works (duration : 3h)
16h00	Start of surfacing
17h10	HROV recovery
17h30	End of dive



HROV manoeuvrability

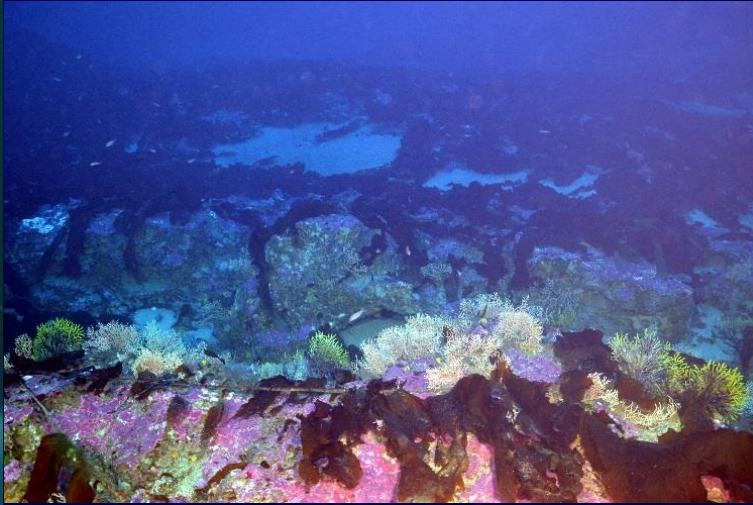
Speed	
Forward propulsion	1 m/s
Reverse propulsion	0,3 m/s (0,4m/s in DOCKING mode)
Ascent / descent propulsion	0,7 m/s
Lateral propulsion	0,3 m/s

- ❖ Ability to work in current, up to 0,5 knot without loss of manoeuvrability
- ❖ Perform tasks on all sorts of seabed morphology, emphasis on canyons, cliffs and steep inclines (with an minimal altitude of 1m)
- ❖ Ability of seafloor landing (for sampling tasks)
- ❖ Manoeuvrability constraints associated to fiber optic
 - ✓ Anchoring risk on seafloor with the fiber optic (or/and rupture of the optical link)
 - ✓ No turnaround



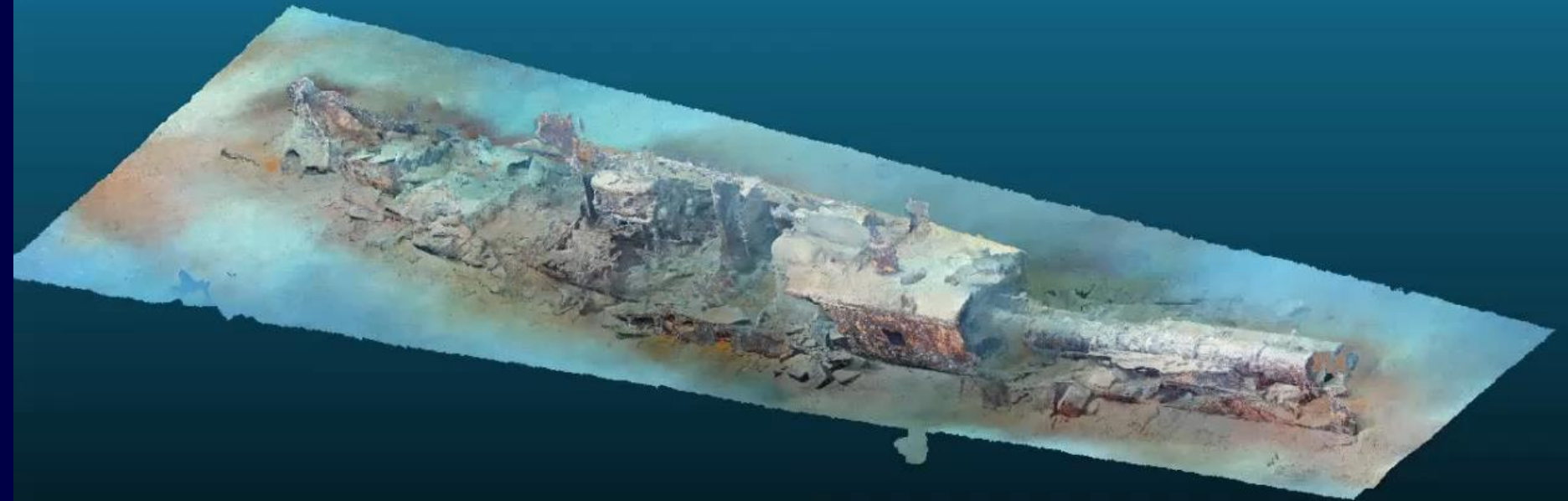
Inspection examples

❖ 3m optical inspection :



❖ 1m optical inspection (0,2m/s)





3D geo-reconstruction from still photo survey

Fully automated process from ~4000 images



Vitesse x4

© Ifremer