

# TURTLE

## technologies for long-term presence in the deep sea

Development of underwater technology with an innovative hybrid robotic underwater lander. This system is not only capable of staying at the bottom of the sea for long periods of time, but also of autonomously relocating itself and surfacing for maintenance operations. This system is also able to dive and ascend with high-energy efficiency, and its autonomous capabilities allow for reduced operational costs and flexibility.

### Objectives

- Developing innovative mechanical technology for long-term permanence in the sea bottom
- Developing efficient technology capable of diving and ascending
- Developing a hybrid robotic lander demonstrator

### Applications

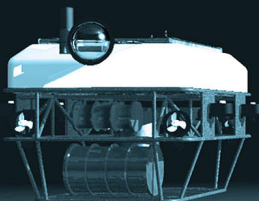
- Seabed observatories (seismic activity, marine biology, oceanography)
- Security applications (harbour protection, border monitoring, intruder monitoring)
- Material/tool transport and deployment to the seabed
- Communications and navigation support for underwater systems

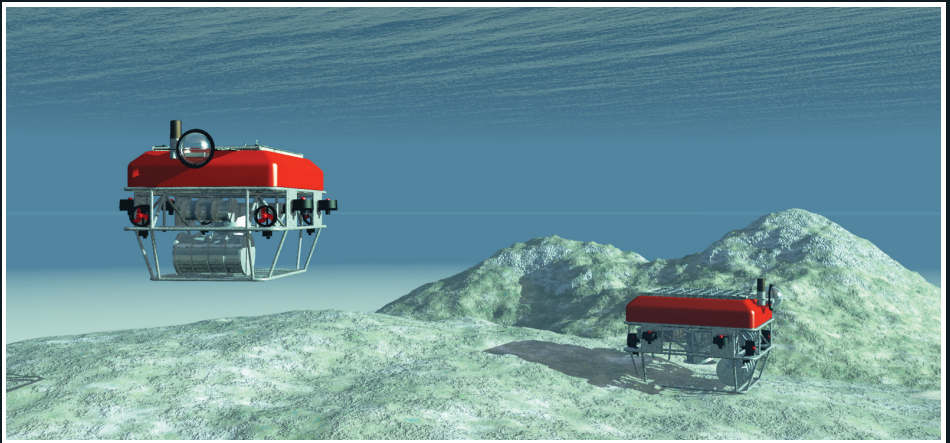
### Advantages

- Energy efficient technologies for ascent-descent operations, comparatively to current solutions
- Hybrid lander combining mobility with long-term presence in the deep sea
- Robotic technologies enabling reduced maintenance and operational requirements
- New possibilities to increase human presence in the deep sea

### Results

- Pressure tolerant batteries
- Pressure tolerant electronics
- Modular, lighter and pressure resistant mechanical structures
- Development of variable buoyancy technology
- Development and incorporation in Portuguese industry of specific know-how and technology to create complex systems for the deep sea
- Innovative hybrid lander increasing the capabilities of observation in the deep sea
- First deep-sea (1000m) robotic system fully developed in Portugal





## Hybrid Robotic Lander Prototype

- \_ Depth rated to 1000m
- \_ 200 Kg payload
- \_ 1400 Kg total weigh
- \_ Autonomous positioning
- \_ Variable buoyancy system
- \_ Thruster actuation
- \_ 8KWh (extensible) on-board batteries
- \_ On-board processing and sensor data logging
- \_ Acoustic communication to the surface
- \_ GPS and Wireless/Satellite communications when on the surface
- \_ Seismic and acoustic monitoring
- \_ Multiple application sensor payload
- \_ Untethered system - no cables sent to the surface or TMS
- \_ Mechanical modularity - 3 main modules - re-changeable with mission goal
- \_ Time-lapse and baited camera capabilities
- \_ Hovering capability without disturbing sea floor and water turbidity

### PARTNERS



### FUNDED BY