WAHOO

epoxsea

CEO
LI Chi Kin (Year 2, COMP)

CFO
NG Hau YI Chloe (Year 1, Engineering + AI)

CTO
TANG Lok Hang (Year 1, Engineering + AI)

Safety Officer
ZHENG Yiqi (Year 1, Engineering)

Pilot
KHAIDAR, Orazkhan (Year 2, ELEC)

Supervised by
Dr. WOO Kam Tim
LEUNG Chun Yin

Software Engineers
YIP Chi Ho (Leader, Year 2, COMP)
CHAN Tak Ming (Year 3, COMP)
CHI Ting-hsuan (Year 3, COMP + ELEC)
TSAI Yiu Ki (Year 2, COMP)
ZHANG Tin Yau (Year 2, COMP)

Hardware Engineers
SONATA Joshua Elnathan (Leader, Year 3, ELEC)
HONG Jiarong (Year 2, ELEC)
JANIUS Erick (Year 2, MECH)
KUO Chen-chieh (Year 3, ELEC + COSC)
LEE Ka Hin (Year 1, CHEM)
LEE Sze Chun Martin (Year 2, ELEC)

Mechanical Engineers
HUI Kan Lap (Leader, Year 2, ISD)
CHAN Ho (Year 3, ISD)
KWOK Wing Lam (Year 3, MECH + AI)
LAI Pui Yin (Year 1, Engineering)
LAM Chun Ho (Year 3, MECH)
MUI Jessye (Year 2, MECH)
NG Shing Yung (Year 2, CIVL)
WONG Chin Ching (Year 2, CIVL)
YANG Shi Long (Year 2, ELEC)

Business
WONG Wing Him (Leader, Year 3, ELEC)
CHEN Wai Yan Grace (Year 1, Engineering + AI)
TAM Siu Ho (Year 2, ELEC)
TANG Justin Kit Hang (Year 2, WBB)

Job Site Safety Analysis

香港科技大學
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

MATE ROV Competition 2024

Abstract

At EPOXSEA, the paramount concern is safety. All personnel are required to prioritize their own safety and utilize protective equipment, such as safety glasses. Engineers are mandated to operate under the supervision of EPOXSEA's safety officer during on-site operations. The safety officer is responsible for ensuring adherence to safety protocols and will enforce disciplinary actions for non-compliance.

Required Personal Protective Equipment (PPE)

- Safety Glasses
- Helmet
- Hair Ties (for loose hair)
- Anti-slip Slippers
- Gloves

Required Training

All engineers at EPOXSEA are mandated to complete a basic safety training course prior to gaining access to the EPOXSEA Lab. This training is facilitated by a designated safety officer and necessitates the successful completion of a quiz. Subsequently, crew members must undertake advanced training, which includes operation-specific safety instruction for poolside and mission operations, encompassing all potential hazards. EPOXSEA adheres strictly to these training protocols.

JSA Table (Pre-launch)

Task	Potential Hazards	Controls	Responsible Person(s)
Entering/ Exiting the pool	Dropping equipment	1. For the enclosed cart, verify that all equipment is securely stored within and that the cart drawer is fully closed. 2. In the case of the open cart, ensure that all tools are securely fastened and exhibit no signs of looseness. 3. Prior to transitioning from the EPOXSEA Lab to the pool, conduct a thorough count of all tools. 4. Upon entering the pool, perform a subsequent count of all tools. 5. The Moving Team is required to vigilantly oversee the cart during transit to prevent any potential tool displacement.	Moving Team
Loading or unloading the ROV system into or from the transport cart	Injury	1. Picking up heavy equipment with a neutral lower back to prevent spinal disc injury 2. Carry heavy objects according to one's limits 3. Lift heavy objects together 4. Do not lift anything above the shoulder level	Moving Team, Deployment Team
Tether Setup	Tether trip incident	1. Confirm that no employee is running. 2. Segregate and relocate personnel away from the tether setup area. 3. Verify that the tether is arranged systematically, devoid of knots or entanglements. 4. Assign an employee to oversee the tether setup zone to prevent unauthorized access.	Deployment Team, Tether Manager

JSA Table (Pre-launch)

Task	Potential Hazards	Controls	Responsible Person(s)
Control Box Setup	Electrocution	1. The control unit should be positioned on a flat, stable platform. 2. Confirm that all batteries, cables, and power connections are dry and positioned at a safe distance from the pool's edge. 3. Verify that the waterproof wire connectors are securely tightened. 4. Ensure the fuse is properly connected and the safety button is operational.	Deployment Team, Pilot
Personal Protective Equipment Check	Injury	1. Confirm that all personnel are equipped with anti-slip footwear. 2. Running is strictly prohibited within the pool area. 3. It is mandatory for crew members to don safety eyewear. 4. Hair ties are made available to staff members with unsecured hair.	Safety Officer
Poolside Check	Slipping	1. Ensure the poolside area is unobstructed. 2. Verify that the tether is not positioned in the path used by crew members to access the pool. 3. Confirm that the props are situated within the designated placement zone in the pool. 4. Maintain a clear pathway for the insertion of large props into the pool.	Deployment Team, Tether Manager, Safety Officer

JSA Table (Pre-launch)

Task	Potential Hazards	Controls	Responsible Person(s)
Deploying ROV	Injury/ Damaging	1. A minimum of three members should be present during the ROV lifting process, with two assigned to lifting and one dedicated to monitoring. 2. Execute movements with deliberate slowness. 3. Verbally enumerate each step during movement. 4. Ensure the pathway is unobstructed and free of any tether. 5. Confirm that all waterproof connectors are securely tightened. 6. Inspect the epoxy component for any signs of deterioration or damage. 7. Verify that all manipulators are securely affixed to the ROV and free of loose parts.	Deployment Team, Safety Officer

JSA Table (Operation)

Task	Potential Hazards	Controls	Responsible Person(s)
ROV Power-up	Electrocution	1. Verify the strain relief cable is securely fastened on both the ROV and the control box. 2. Confirm the security of all electronic connections. 3. All non-crew members without safety glasses must maintain a safe distance. 4. Ensure the thrusters are clear of obstructions and that the protective guard is securely fastened. 5. Recheck the operational status of the fuse and safety button. 6. Ensure the ROV is free from human contact. 7. Upon completion of the preceding six steps, audibly announce “ROV Can Start” to signal the initiation of the ROV.	Deployment Team, Pilot
In-operation	Electrocution Injury Slipping	1. Tether Manager is responsible for maintaining the tether in an orderly state. 2. Personnel are strictly prohibited from making contact with the ROV while it is powered on. 3. Explicit instructions, such as “ROV Stop”, “ROV Can Start” and “Power Off”, should be audibly communicated to enable the pilot to effectively manage various scenarios.	Safety Officer, Crew Members, Pilot, Tether Manager
In-Reparation	Electrocution Injury	1. Confirm the power supply is deactivated. 2. Poolside crew members should assist in guiding the ROV to the poolside to prevent potential tether damage during extraction. 3. Protective equipment must be donned during the repair of the ROV. 4. Upon completion of repairs, the ROV Power-up procedure should be reinitiated.	Engineers, Tether Manager, Safety Officer

JSA Table (Operation)

Task	Potential Hazards	Controls	Responsible Person(s)
ROV Retrieval	Electrocution Injury Damage to Equipment Miscommunications	Here are the revised sentences: 1. A power-off signal should be communicated to all team members. 2. The pilot is required to depress the safety button and disconnect the power supply to deactivate the ROV. 3. Poolside crew members should assist in guiding the ROV to the poolside to prevent potential tether damage during extraction. 4. Crew members in the pool are tasked with monitoring the pool bottom for any dislodged components. 5. A minimum of three team members are required to assist in hoisting the ROV to the poolside, with two assigned to lifting and one to oversight. 6. Poolside crew members should commence the collection of props and transfer them to team members stationed near the poolside. 7. Crew members should utilize a towel to ensure the ROV power connector is dry prior to disconnection from the tether. 8. The Deployment Team is responsible for inspecting the ROV for any loose components. 9. The Tether Manager is tasked with the orderly arrangement of the tether. 10. Team members should initiate the packing of equipment, adhering to the same procedures as outlined in the “Entering/Exiting the pool” task.	Deployment Team, Pilot

APPENDICES

Appendix A: Safety Checklists for construction and operation

Safety Checklists

Construction

- [ ] Ensure machinery and tools in good condition before use
- [ ] Wear suitable protective equipment
- [ ] Shut down electronic appliances that are not in use
- [ ] Perform soldering or other practices that involve toxic gas in a well-ventilated area
- [ ] Return all tools to designated areas after use

Operation

Pre-deployment

- [ ] All electronics connections are secured and correctly connected and non-exposed
- [ ] Screw caps on all cameras are secured
- [ ] Cables and tethers are properly tightened
- [ ] Manipulators are all properly mounted and secured onto ROV
- [ ] No damage in ROV frame
- [ ] Tether is laid out neatly without knots or tangles
- [ ] Surface station tether strain relief is connected, tether ethernet and power are connected
- [ ] Surface station is stable and on a level surface
- [ ] Deck area is clear of clutter and tripping hazards
- [ ] Thrusters free from obstruction
- [ ] All members wearing appropriate and safe attires

Power-up

- [ ] Control Box is receiving 48V nominal
- [ ] Verify camera connection to the Control Box is stable
- [ ] Perform thruster test, joystick movements correspond with thruster activity
- [ ] Test any electrical manipulators that require pilot control

Deployment

- [ ] Verify no excess bubbles are coming out
- [ ] Clear signal communication:
  - [ ] “Kill” when power needs to be cut off
  - [ ] “Contact” before touching WAHOO
  - [ ] “Launch” when WAHOO is ready to be operated underwater
  - [ ] “Power on” before turning on WAHOO
- [ ] Appropriate length of the tether is released into water to prevent pull on ROV or entanglement

Loss of Communication/ Camera feed

- [ ] Pilot calls out “Kill” and powers down ROV
- [ ] Crew members retrieve ROV via tether to shore
- [ ] Begin troubleshooting process until communication is restored
- [ ] Document the cause of failure and implemented repair method

APPENDICES

Appendix B: Safety Training Record

No	Name	Basic Training	Advanced Department Training	*Advanced Operation Training*
1	**CHAN** Ho	Passed	Passed	N/A
2	**CHAN** Tak Ming	Passed	Passed	Passed
3	**CHEN** Wai Yan Grace	Passed	Passed	N/A
4	**CHI** Ting-hsuan	Passed	Passed	N/A
5	**HONG** JIARONG	Passed	Passed	Passed
6	**HUI** Kan Lap	Passed	Passed	Passed
7	**JANIUS** Erick	Passed	Passed	N/A
8	**KHAIDAR**, Orazkhan	Passed	Passed	Passed
9	**KUO** Chen-chieh	Passed	Passed	Passed
10	**KWOK** Wing Lam	Passed	Passed	N/A
11	**LAI** Pui Yin	Passed	Passed	Passed
12	**LAM** Chun Ho	Passed	Passed	Passed
13	**LEE** Ka Hin	Passed	Passed	N/A
14	**LEE** Sze Chun	Passed	Passed	N/A
15	**LI** Chi Kin	Passed	Passed	Passed
16	**MUI** Jessye	Passed	Passed	Passed
17	**NG** Hau Yi Chloe	Passed	Passed	N/A
18	**NG** Shing Yung	Passed	Passed	N/A
19	**SONATA** Joshua Elnathan	Passed	Passed	Passed
20	**TAM** Siu Ho	Passed	Passed	N/A
21	**TANG** Justin Kit Hang	Passed	Passed	Passed
22	**TANG** Lok Hang	Passed	Passed	N/A
23	**TSAI** Yiu Ki	Passed	Passed	N/A
24	**WONG** Chin Ching	Passed	Passed	N/A
25	**WONG** Wing Him	Passed	Passed	Passed
26	**YANG** Shi Long	Passed	Passed	Passed
27	**YIP** Chi Ho	Passed	Passed	Passed
28	**ZHANG** Tin Yau	Passed	Passed	N/A
29	**ZHENG** Yiqi	Passed	Passed	Passed