



# Explorer Class 2018 MATE ROV Competition Job Safety Analysis

**Chief Executive Officer**

Kin Ip Mong

| Year 2 Computer Engineering

**Chief Financial Officer**

Mengdi Zhang

| Year 2 Computer Science

**Chief Technical Officer**

Minsoo Khang

| Year 1 Engineering

**Mechanical Engineers**

Tsz Ho Wong

| Year 1 Engineering

Anthonie Tjendana

| Year 2 Mechanical Engineering

Jaewook Lee

| Year 2 Mechanical Engineering

**Electronic Engineers**

Sanghyun Jeon

| Year 3 Electronic Engineering

Chee Hau Cheng

| Year 2 Computer Engineering

Ka Yan Yiu

| Year 2 Dual Degree Program

Kuang Yu Hsueh

| Year 1 Engineering

Yat Wing Cheung

| Year 1 Dual Degree Program

**Software Engineers**

Kevin Pratama

| Year 2 Computer Science

Adrian Prawira Susanto

| Year 2 Computer Science

Jeongseok Hyun

| Year 2 Computer Engineering

David Sun

| Year 1 Engineering

Riwandy

| Year 1 Engineering

**Supervised by** Dr. Kam Tim Woo, Chun Yin Leung, Sau Lak Law

# JOB SAFETY ANALYSIS

Tasks	Hazards	Controls	
<b>General ROV Development</b>			
Using heavy machinery and power tools	Hearing Damage	Wear earmuffs to prevent noise-induced hearing loss	
	Eye injury	Wear safety goggles to prevent flying debris from causing eye injury	
	Flesh wound		Ensure the machinery/tool is in good condition before use
			Keep a safe distance from moving blades or drill bits
			Touch heavy machineries if and only if they are completely stopped
	Burns		Turn off the machine when not in use
			Do not touch the cut pieces immediately after cutting or drilling
Respiratory irritation and damage		Wear protective gloves when touching hot metal pieces	
Making buoyancy foam	Irritation	Wear particulate respirators to filter out airborne particulate matter	
	Burns	Wear protective gloves when working with epoxy	
		Turn off the foam cutter when not in use	
	Respiratory irritation and damage	Wear protective gloves when handling the cutter	
Wear particulate respirators to filter out airborne particulate matter			
Using 3D printer	Burns	Perform sanding under a fume hood	
		Do not touch the extruder at all time	
		Wait until the print bed cool down to collect the print	
	Flesh wound	Keep anything away from stepper motor when it is printing	
	Respiratory irritation	Keep a safety distance from the extruder when printing to avoid toxic foam	
Foot injury	Keep the printer in a safe and secure place		
Eye injury	Wear safety goggles to prevent from snapped 3D print material to get into our eyes		
Soldering circuit board and other electronic components	Fire hazard	Turn off soldering iron when not in use	
		Do not leave hot iron unattended	
		Remove combustible material from work area	
	Skin burnt	Place soldering iron on its holder after each use	
Chemical inhalation	Perform work under a fume hood or in a well-ventilated area		
Waterproofing electronic components	Irritation	Wear protective gloves when touching epoxy	
	Chemical inhalation	Perform work under a fume hood or in a well-ventilated area	

Operations		
Transporting the ROV	Foot injury	Wear close-toed shoes when pushing transportation cart Secure all loose and moving parts on the transportation cart with cable ties
	Impact with the transportation cart	Do not walk in front of the transportation cart Keep transported objects inside the cart
Loading or unloading the ROV system into or from the transportation cart	Back Injury	Picking up heavy equipment with a neutral lower back to prevent spinal disc injury
		Carry heavy objects according to one's limits
		Lift heavy objects together
	Do not lift anything above the shoulder level	
Hand Injury	Make sure all handles are strong and safe Ensure no sharp objects around handles	
Foot injury	Wear close-toed shoes	
Slipping	Wear non-slip shoes near the pool	
	Do not run near the pool	
Setting up power supply	Overvoltage	Check the voltage reading that it shows nominal 48V
Setting up air pump	Over-pressurized	Set pressure regulator to 275kPa
		Ensure no air leaks in the pneumatics fittings
		Depressurize the compressor tank after every use
Setting up the tether	Loose tether	Secure the tether with carabiner strain reliefs on the ROV side and the control box side
	Tangled tether	Stow the tether into the tether cart roll after every use
Managing the tether	Tether damage	Supply enough tether to ROV to prevent excessive tension on the tether Hold the tether up to prevent friction with the pool edge
	Tripping over tether	Make sure the tether is neatly laid on the floor
Checking buoyancy	Water Leakage	Check all connections before putting ROV in water
	Back, Shoulder and forearm strain	Carry ROV with at least two people Keep a neutral lower back when picking up ROV from the pool
Dry Running the ROV	Damaging the frame or manipulators	Put ROV on the stand to prevent any physical damage
	Flesh wound	Put warning labels on thrusters and sharp edges Yell "contact!" when someone needs to touch the ROV, signalling the pilot to put down the controller
		Keep hands at a safe distance when thrusters are turning

Product Demonstration	Thruster malfunction	Ensure that someone is on standby to push the emergency kill switch
Deploying and retrieving ROV	Back, Shoulder and forearm strain	Carry ROV with at least two people
		Maintain a neutral lower back when picking up ROV from the pool
		Avoid twisting motions when retrieving ROV
		Do not reach too far into the water
	Flesh Wound	Yell "contact!" when someone needs to touch the ROV, signalling the pilot to put down the controller
		Keep hands at a safe distance while thrusters are turning
	Electrical shock	Keep electronic components away from the pool and protect them from splashes
		Check and secure all connections
		Ensure no exposed and loose wire
		Kill power immediately when there is an indication of electrical problems
<b>Required Training</b>		<b>Required Personal Protective Equipment</b>
Use of heavy machinery and tools		Close-toed shoes
Loading and unloading equipment		Gas masks and respirators
Setting up power supply and air pump		Protective gloves
Dry running the ROV on deck		Noise-blocking earmuffs
Launching the ROV		Protective goggles