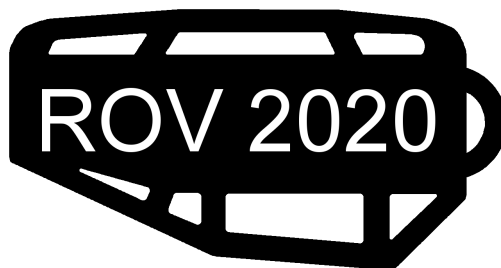


# Test Plan

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Reviewed		
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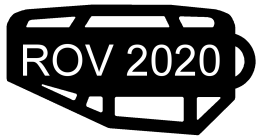
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## DOCUMENT HISTORY

Version	Date	Changes made	Sign	Reviewed
0.1	-	First Draft	All	-



## NOTATIONS

- ROV - Remotely Operated Underwater Vehicle
- ROS - Robot Operating System
- RPi - Raspberry Pi 3
- LiU - Linköping University
- ISY - Linköping University department of electrical engineering
- GUI - Graphical User Interface
- CoG - Center of gravity
- CoB - Center of buoyancy
- DP - Decision Point
- HIL - Hardware in Loop



## 1 INTRODUCTION

This document covers the groups planned tests during the project. The tests purposes are generally for verifying the groups requirement, specified in the Requirement specification. The tests are also used for verifying the current model of the ROV and for collecting data to use in the new simulator. The structure of the planned tests are as follows:

**Test:** Name of the test.

**Nr:** Test number.

**Description:** Description of the test.

**Responsible:** Who is responsible for the test.

**Week:** What week will the test be conducted.

**Extra:** Any other relevant information about the test, e.g. if the test requires special equipment.

## 2 DEVELOPMENT TESTS

This section covers the planned tests that are necessary for the development of the magnetometer script, model and simulator.

**Test:** Verification of the ROV:s current functionality.

**Nr:** 1

**Description:** Test for verifying that the ROV possesses the current functionality specified in last years Technical Documentation.

**Responsible:** Olof Mlakar & Nibras Musa.

**Week:** 41

**Extra:** Requires the collection and set up of the small test pool provided by ISY.

**Test:** Collection and verification of parameter data for the ROV model.

**Nr:** 2

**Description:** Test for collecting data to be used in the new model and verification of old parameter values.

**Responsible:** Olof Mlakar.

**Week:** 41

**Extra:** Requires the small test pool provided by ISY.

**Test:** Test of new ROV model.

**Nr:** 3

**Description:** Test to check the accuracy of the new ROV model.

**Responsible:** Olof Mlakar.

**Week:** 45

**Extra:** Requires the small test pool provided by ISY.

**Test:** Collection of parameter data for the magnetometer script.



**Nr:** 4

**Description:** Test to collect data to be used when developing the magnetometer script.

**Responsible:** Nibras Musa.

**Week:** 42

**Extra:** Requires the small test pool provided by ISY.

**Test:** Test of the magnetometer script.

**Nr:** 5

**Description:** Test to check the accuracy of the magnetometer script.

**Responsible:** Nibras Musa.

**Week:** 46

**Extra:** Requires the small test pool provided by ISY.

**Test:** Collection of parameter data for the sensors on the ROV.

**Nr:** 6

**Description:** Test to collect data from the .

**Responsible:** Olof Mlakar.

**Week:** 42

**Extra:** Requires the small test pool provided by ISY.



### 3 REQUIREMENT TESTS

This section covers the planned tests for verifying the requirements specified in the Requirement Specification.

#### 3.1 Model

This section covers the planned tests for verifying that the model meets the agreed upon requirements. Most of these test will require access to a big test pool.

**Test:** Verification of requirement 1.

**Nr:** 7

**Description:** Test for verifying that the simulation of a mission where the ROV travels straight from position A to B does not differ more than 20% in relation to the real ROV.

**Responsible:** Olof Mlakar.

**Week:** 48

**Extra:** Requires a big test pool.

**Test:** Verification of requirement 2.

**Nr:** 8

**Description:** Test for verifying that the simulation of ROV:s orientation does not differ more than 45 degrees after 5 seconds in relation to the real ROV.

**Responsible:** Olof Mlakar

**Week:** 48

**Extra:** Requires a big test pool.

**Test:** Verification of requirement 3.

**Nr:** 9

**Description:** Test for verifying that the simulated sensor data includes noise.

**Responsible:** Olof Mlakar

**Week:** 48

**Extra:** -

**Test:** Verification of requirement 4.

**Nr:** 10

**Description:** Test for verifying that when the ROV is traveling in a straight line the simulated vehicle velocity does not differ by more than 20% from the sensor fusion model's measurement.

**Responsible:** Olof Mlakar

**Week:** 48

**Extra:** Requires a big test pool.

**Test:** Verification of requirement 5.

**Nr:** 11





**Description:** Test for verifying that the ROV:s, during constant input signals, simulated angular velocity does not differ from the sensor fusion model's measurements by more than 20% on average.

**Responsible:** Olof Mlakar

**Week:** 48

**Extra:** Requires a big test pool.

### 3.2 HIL

This section covers the planned tests for verifying that the simulator possesses the functionality that was agreed upon.

**Test:** Verification of requirement 6.

**Nr:** 12

**Description:** Test for verifying that the ROV can send its control inputs to the simulator.

**Responsible:** Nibras Musa

**Week:** 47

**Extra:** -

**Test:** Verification of requirement 7.

**Nr:** 13

**Description:** Test for verifying that the simulator is able to estimate the states of the ROV utilizing the control inputs from the ROV.

**Responsible:** Nibras Musa

**Week:** 47

**Extra:** -

**Test:** Verification of requirement 8.

**Nr:** 14

**Description:** Test for verifying that the simulator is able to, based on the ROV's estimated state, simulate realistic sensor inputs.

**Responsible:** Nibras Musa

**Week:** 47

**Extra:** -

**Test:** Verification of requirement 9.

**Nr:** 15

**Description:** Test for verifying that the simulator is able to send the simulated sensor inputs to the ROV.

**Responsible:** Nibras Musa

**Week:** 47

**Extra:** -



### 3.3 Environment

This section covers the planned tests for verifying that the simulator meets the agreed upon requirements.

**Test:** Verification of requirement 10.

**Nr:** 16

**Description:** Test for verifying that the simulation environment is able to show a visualization of the ROV in a 3D space in the shape of a cuboid.

**Responsible:** Fabian Steen

**Week:** 48

**Extra:** -

**Test:** Verification of requirement 11.

**Nr:** 17

**Description:** Test for verifying that the dimensions of the simulation environment is changeable.

**Responsible:** Fabian Steen

**Week:** 48

**Extra:** -

**Test:** Verification of requirement 12.

**Nr:** 18

**Description:** Test for verifying that the simulation environment is able to contain walls that the vehicle can sense, and that the ROV cannot pass through the walls.

**Responsible:** Fabian Steen

**Week:** 48

**Extra:** -

**Test:** Verification of requirement 13.

**Nr:** 19

**Description:** Test for verifying that the ROV in the simulation environment is able to mimic the real ROV in real time.

**Responsible:** Fabian Steen

**Week:** 48

**Extra:** -

**Test:** Verification of requirement 14.

**Nr:** 20

**Description:** Test for verifying that the simulation environment supports placing objects that the ROV can detect.

**Responsible:** Fabian Steen

**Week:** 48

**Extra:** -

**Test:** Verification of requirement 15.

**Nr:** 21

**Description:** Test for verifying that it is possible to generate a point that follows a set path, which is detectable by the



simulated camera signal.

**Responsible:** Fabian Steen

**Week:** 48

**Extra:** -

**Test:** Verification of requirement 16.

**Nr:** 22

**Description:** Test for verifying that the ROV is able to detect obstacles with the simulated sonars.

**Responsible:** Fabian Steen

**Week:** 48

**Extra:** -

### 3.4 GUI

This section covers the planned tests for verifying that the GUI possesses the functionality that was agreed upon.

**Test:** Verification of requirement 19.

**Nr:** 23

**Description:** Test for verifying that the user is able to view the simulated movements in the simulation environment.

**Responsible:** Jacob Ljungberg

**Week:** 48

**Extra:** -

**Test:** Verification of requirement 20.

**Nr:** 24

**Description:** Test for verifying that the user is able to specify the dimensions of the environment via the GUI.

**Responsible:** Jacob Ljungberg

**Week:** 48

**Extra:** -

**Test:** Verification of requirement 21.

**Nr:** 25

**Description:** Test for verifying that it is possible for the user to set start and goal points for the mission from the GUI.

**Responsible:** Jacob Ljungberg

**Week:** 48

**Extra:** -

**Test:** Verification of requirement 22.

**Nr:** 26

**Description:** Test for verifying that the user is able to control mission selection and mission simulation from the GUI.

**Responsible:** Jacob Ljungberg

**Week:** 48

**Extra:** -



**Test:** Verification of requirement 23.

**Nr:** 27

**Description:** Test for verifying that it is possible to select a manual mode to steer the simulation model in real-time through controller inputs.

**Responsible:** Jacob Ljungberg

**Week:** 48

**Extra:** -

**Test:** Verification of requirement 24.

**Nr:** 28

**Description:** Test for verifying that the user is able to control the movements of the inserted objects via the GUI.

**Responsible:** Jacob Ljungberg

**Week:** 48

**Extra:** -

**Test:** Verification of requirement 25.

**Nr:** 29

**Description:** Test for verifying that there is a visual representation of the ROV and its surroundings in the GUI.

**Responsible:** Jacob Ljungberg

**Week:** 48

**Extra:** -

**Test:** Verification of requirement 26.

**Nr:** 30

**Description:** Test for verifying that the user is able to activate/deactivate integration of hardware-in-the-loop (HIL).

**Responsible:** Jacob Ljungberg

**Week:** 48

**Extra:** - *[After our meeting with Anton this morning (30/9), I am no longer certain about this one. / Jacob Ljungberg]*

**Test:** Verification of requirement 27.

**Nr:** 31

**Description:** Test for verifying that the user can calibrate the magnetometer from the GUI.

**Responsible:** Nibras Musa & Jacob Ljungberg

**Week:** 48

**Extra:** -

### 3.5 Magnetometer

**Test:** Verification of requirement 32.

**Nr:** 32

**Description:** Test for verifying that the ROV possesses the functionality for automatically calibrating the magnetometer.

**Responsible:** Nibras Musa



**Week:** 48

**Extra:** -

textbfTest: Verification of requirement 33.

**Nr:** 33

**Description:** Test for verifying that the automatic calibration of the magnetometer is as accurate as the manual calibration.

**Responsible:** Nibras Musa

**Week:** 48

**Extra:** -