TEST PLAN

DEMO FOR

by Artjoms Zelenkevičs

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1. Introduction

The Demo Test Plan created as a sample that demonstrates two test sections: software and hardware. Each section has its own scenario and is described separately. This Demo is made to share my logic and systematic way of thinking and hopefully will clearly show not only my will to become a QA Engineer at SPH Engineering, but also what chosen test deliverables will be.

1.1. Objectives

Airborne drone-mounted GPR system is a geophysical device used for fast and precise GPR data collection with automated tools. This system consists of Zond Aero 500 NG GPR device and drone equipped with terrain following system. The test team is responsible for testing the product and ensuring it meets their needs.

Section 1 of this Demo Test Plan will deliver description, scope, risks, approach, environment, and deliverables for testing Software. Handling of the GPR failure in flight and software response is chosen as a sample test case for this section.

Section 2 of this Demo Test Plan will deliver description, scope, risks, approach, environment, and deliverables for testing Hardware. GPR stress testing under vibration is chosen as a sample test case for this section.

1.2. Team Members

Team Member Name	Role
Artjoms Zelenkevičs	QA Engineer
Jānis Radars	GPR Engineer

Section 1: Software

2. Scope

The scope of this test is to check software reaction on GPR failure or connection loss. Possible scenarios for this test are:

1. In lab simulation;
2. In field (on the ground);
3. In field (during manually controlled flight);
4. In field (during automated flight).

GPR failure or lost connection will be simulated with scripts. The results of this test will be provided further to the software development team.

3. Risks

The following risks have been identified and their impact weighted. Risk possible triggers and their mitigation plan delivers information on how to not become an issue.

#	Risk	Impact	Trigger	Mitigation Plan
1	Loss of all data collected before failure	High	The connection to GPR fails	Make a GPR save all the data automatically and send data updates to the software
2	Drone will need to be stopped manually	Medium	Drone continues the automated flight while doesn't know the GPR is down	Software stops the drone if connection to the GPR is lost.
3	Drone will move even if the GPR is still working and collecting data, but has no signal	Medium	Drone returns to the "home" spot	Software stops the drone if connection to the GPR is lost.

4. Test Approach

GPR failure or connection loss will be simulated using PowerShell scripts that will block the GPR IP with the firewall. During the test all the logs will be collected to see how software responds to the problem. System should show:

1. Connection loss / GPR failure found exact moment;
2. Error logs;
3. Notification for the drone operator;
4. Switching to the safe mode (if needed).

Automated unit tests currently are not planned.

5. Test Environment

Connection loss or GPR failure can be simulated in lab or recreated in field. In both cases test is simulated with script that closes software connection with the drone.

6. Test Cases

6.1. Test Case 1 (in the lab)

Steps:

1. Start simulation of automated flight with simulated GPR and connected software;
2. Simulate the GPR connection loss with PowerShell;
3. Monitor software behavior.

Expected Results:

1. Software logs the connection loss;
2. Software logs that drone is switched to the safe mode and stopped it in place;
3. Operator receives notification.

6.2. Test Case 2 (in the field)

Steps:

1. Start automated flight with GPR and connected software;
2. Simulate connection loss with PowerShell;
3. Monitor software and drone behavior.

Expected Results:

1. Software logs the connection loss;
2. Software switch drone to the safe mode and stops it in place;
3. Operator receives notification.

7. Test Metrics

Main test metrics for this test are:

- Error detection time;
- Critical defects found.

8. Exit Criteria

Test is considered finished when tests were performed in all Environments and all the logs were collected.

9. Deliverables

9.1. Test Schedule

Task Name	Start	Finish	Effort	Comments
Test Planning			2 d	
Review Requirements documents			1 d	
Create initial test estimates			1 d	
Functional testing – Lab Testing: Simulation of the problem on program level			1 w	
Functional testing – Field Testing: Problem simulation during automated flight			1 w	
Test report creation			2 d	

9.2. Deliverables

Deliverable	For	Date / Milestone
Test Plan	Project Manager Lead QA Test Team	
Test Results	Project Manager	
Test Status report	Lead QA	
Metrics and logs	All team members	

Section 2: Hardware

2. Scope

The scope of this test is to check hardware strength under stress (vibration). Possible scenario for this test is in the laboratory.

Stress vibration will be will be applied to the GPR manually with vibrating plate. The results of this test will be provided further to the hardware development team.

3. Risks

The following risks have been identified and their impact weighted. Risk possible triggers and their mitigation plan delivers information on how to not become an issue.

#	Risk	Impact	Trigger	Mitigation Plan
1	GPR system fails and loses connection	High	Excessive vibration causes mechanical damage	Research systems fail, check if it happens because mechanical issues
2	GPR system stops collecting data	Medium	Anthena displacement or mechanical damage	Make a GPR system send a signal to the software to stop the drone and a notification about high stress to the operator

4. Test Approach

Stress to the GPR will be applied with vibrating plate. During the test visual information about the GPR will be collected. After the test GPR will be checked inside to detect any mechanical deformations if there are such. If the GPR fails, system should show an error log.

5. Test Environment

Stress to the GPR will be applied in the lab with vibration plate. Hardware should not be mounted to anything.

6. Test Cases

6.1. Test case 1 (long run)

Steps:

1. Connected to the software GPR is put on a vibration plate;
2. Stress is applied to the GPR for 30 minutes;
3. Monitoring of visual deformations during the test;
4. Check device inner parts and possible damage after stress application.

Expected Results:

1. GPR handles the stress and do not close the connection with software;
2. If GPR fails, the software logs are saved and operator is notified of failure.

6.2. Test case 2 (extreme stress)

Steps:

1. Connected to the software GPR is put on a vibration plate;
2. Twice more stress is applied to the GPR for 30 minutes;
3. Monitoring of visual deformations during the test;
4. Check device inner parts and possible damage after stress application.

Expected Results:

1. GPR handles the stress and do not close the connection with software;
2. If GPR fails, the software logs are saved and operator is notified of failure.

7. Test Metrics

Main test metrics for this test are:

- Visual defect level;
- Mechanical defect level;
- Possible stress level that could be handled.

8. Exit Criteria

Test is considered successfully finished if:

- GPR remains operational after 30 minutes of stress application;
- No critical mechanical or visual damage is observed;
- No connection loss occurs.

Test is considered failed if:

- Connection is lost before 30 minutes of stress application;
- Visible cracks or mechanical deformation appear;
- Internal components become loose;
- Connection fails.

9. Deliverables

9.1. Test Schedule

Task Name	Start	Finish	Effort	Comments
Test Planning			2 d	
Review Requirements documents			1 d	
Create initial test estimates			1 d	
Functional testing – Lab Testing: Stress (Vibration) application in lab environment			1 d	
Test report creation			2 d	

9.2. Deliverables

Deliverable	For	Date / Milestone
Test Plan	Project Manager Lead QA Test Team	
Test Results	Project Manager	
Test Status report	Lead QA	
Metrics and logs	All team members	