



**DG ECHO LEAPFROG
(GA 872233)**



Deliverable E.3: RPAS module maintenance and upgrade handbook

Coordinator name: Kyriacos Hadjigeorgiou

Coordinator email: khadjigeorgiou@cd.moi.gov.cy

Project Name: **Leading Activities for enrolment of RPAS units in the voluntary pool**

Acronym: LEAPFROG

Grant Agreement: 782233

Project website: www.kios.ucy.ac.cy/leapfrog

Version: 1



DG ECHO LEAPFROG (GA 872233)



Table of Contents

1	Introduction.....	2
2	Hardware	2
2.1	Batteries:	2
2.2	Motors and propellers:.....	3
2.3	Airframe:.....	3
2.4	Software	3
3	Personnel.....	3
3.1	Training.....	3
4	Conclusion	3

1 Introduction

Maintenance and care of the equipment as well as frequent training of the personnel are the most important parameters that ensure airworthiness and personnel safety. A careful and regular inspection of the hardware ensures long lasting performance of the equipment. Software on the other hand, requires to be always up to date to ensure the stability of the software, add new or enhanced features and guarantee better compatibility with different devices or applications.

2 Hardware

A regular inspection, maintenance and care of the equipment is a necessity to ensure that the equipment will be perform safely as expected according to manufacturer's and airworthiness standards and to extend its life. Most small to mid-range UAS equipment available at the moment are powered by electricity, thus, battery power source. Battery inspection and proper use is one of the most important aspects in electrically powered UAS equipment. Improper long-term use of the batteries may lead to catastrophic consequences for the equipment and public safety, such as fire during flight etc. Nevertheless, other maintenance procedures are important too, such as regular screws tightening, electric motors and propellers inspection etc. In addition to hardware maintenance, software updates and firmware upgrades should be checked to be up to date. To ensure equipment reliability, significant maintenance procedures and standards are summarized as shown below. Although this report highlights the important maintenance procedure, it is always a requirement to follow the corresponding maintenance manuals of each equipment.

2.1 Batteries:

- Correct usage of batteries duty cycle, charging and storing according to manufacturer's guidelines.
- Avoid exposure of the batteries to extreme weather (e.g. high temperatures) for extended period of time.
- After every flight, batteries have to be inspected for possible swelling.

The project has received funding from the European Union's 2018 Call for proposals for buffer capacities for addressing temporary shortcomings in extraordinary disasters under grand agreement ECHO/SUB/2018/BUF01/782233.



DG ECHO LEAPFROG (GA 872233)



2.2 Motors and propellers:

- The motors should be cleaned regularly for possible dust and ensure that are rotating freely.
- Check if an individual motor has higher temperature than others after flight. This should indicate that there is a malfunction of the motor or Electronic Speed Control or even Center of Gravity may need to be adjusted.
- Propellers have to be inspected for any possible cracks or weariness due to excessive vibrations. Surfaces of the propellers should always be cleaned to ensure proper lift distribution.

2.3 Airframe:

- The airframe should be inspected regularly for possible cracks or structure separation. Airframe components should be replaced if cracks are detected. Airframe screws should be checked regularly to ensure that are not loosen.
- The airframe should be cleaned frequently, especially the electronic input and output ports such as camera connectors etc. The equipment should be stored in dry and cool places avoiding humidity and dust.
- Any waterproof covers have to be checked that are in place.

2.4 Software

- Before every flight, software updates and firmware regarding the equipment should be checked and updated to the latest available.
- After performing an upgrade of firmware, the equipment should be tested prior any operational flight to ensure that the UAS performs as expected.

3 Personnel

3.1 Training

Considering that RPAS operations in disaster situations create heavy stress on operators it is of paramount importance that team members of the RPAS unit be trained and certified for disaster management operations. Training is necessary for all pilots and air crew personnel to take the necessary knowledge, tools and skill-set to make informed decisions on UAS utilization in emergency services. However, it is very important that all pilots within the unit shall maintain proficiency in their abilities. Members who do not have any documented training or flight time within predefined timespan will have to show proficiency before performing any future deployment or exercise. Recurrent training is not limited to actual pilot skills but includes knowledge of all pertinent UAS/aviation matters.

4 Conclusion

A summary of the basic maintenance procedures has been presented, although these guidelines are helpful for understanding the most important aspects of maintenance and care of the equipment and personnel, it is a requirement that the manufacturer's manuals and guides are followed at all times.

The project has received funding from the European Union's 2018 Call for proposals for buffer capacities for addressing temporary shortcomings in extraordinary disasters under grand agreement ECHO/SUB/2018/BUF01/782233.