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Legal Implications of Drone Use

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List of Acronyms

DLR	Deutsches Zentrum für Luft- und Raumfahrt e.V.
GPS	Global Positioning System
RPA	Remotely Piloted Aircraft
UAV	Unmanned Aerial Vehicle

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Executive Summary

This document describes the legal implications of the drones use in HEIMDALL.

This document is organised as follows:

- First we introduce in Sec. 1 the legal aspects that need to be considered with respect to the use of drones in HEIMDALL.
- Then we summarize the drones' system specifications in Sec. 2.
- In Sec. 3 we discuss the legal implications of the drones use in HEIMDALL final demonstration. First, we summarize the most important legal aspects that need to be considered. For the considered aspects, we then describe the actions that will be implemented to comply with the regulations.
- Sec. 4 provides an outlook on the legal implications of drones system developed in HEIMDALL once the approved EU wide drones regulation will be enforced.
- This is followed by conclusions in Sec. 5.

1 Introduction

The use of drones in the EU is currently subject to the regulations in each of the individual countries. In June 2019 common European rules on drones were published to ensure drone operations across Europe are safe and secure. These rules will be applicable starting from June 2020.

HEIMDALL final demo is taking place in March 2020 in Catalunya (Spain). This implies that the use of drones in the final demo will be subject to Spanish regulations. In this deliverable, we summarize the Spanish regulation with respect to drones, and indicate the actions that will be taken to comply with them.

The drones system we are developing in HEIMDALL is expected to continue its development beyond HEIMDALL final demo to support end users operations. Therefore, we provide in this deliverable an outlook on how the drones system that has been developed in HEIMDALL will comply with the EU wide drones regulation.

2 Drones System Specifications

The drones system developed in HEIMDALL consists of several autonomous Unmanned Aerial Vehicles (UAVs). Our UAVs are custom built based on a S900 frame from DJI [3]. In addition, UAVs are equipped with the following main pieces of hardware:

- PixHawk 2.1 and Ardupilot [4] as flight controller.
- Global Positioning System (GPS) [1] receiver to localize the UAV.
- Mobilicom MCU-30 [2] to permit communication between UAV and base station.
- On-board computer [6][5] to permit an autonomous flight.
- On-board receiver to receive commands from a safety pilot's remote controller.
- A visual [8] and a thermal camera [7].

UAVs are able to fly autonomously thanks to the flight controller, GPS receiver, and on-board computer. One UAV, including its payload, weights approximately 9.5 kg.

3 Legal Implications of Drones Use at the Project Final Demonstration

The final HEIMDALL demonstration will take place in March 2020 in Catalunya (Spain). In Spain, UAVs are currently subject to the legislation described in "Real Decreto 1036/2017", which was published in December 2017. In particular, "Real Decreto 1036/2017" specifies the regulations that apply to remotely piloted aircraft (RPA) under 150 kg that are not intended to fly in indoor confined spaces. Our autonomous UAVs lie within this description.

Next we summarize the main points described in "Real Decreto 1036/2017" that are relevant to the HEIMDALL system and to the final HEIMDALL demonstration:

General operations

- 1) General operations with UAVs are not allowed in areas with a high density of buildings, in areas with a high concentration of people, and in controlled air space. Additionally, it is required that the UAV pilot has visual contact with the UAV, and the UAV must fly at a maximum height of 120 m. Otherwise, the flight is classified as a special operation, for which different rules apply and a special permission must be issued by the corresponding authority.
- 2) UAVs less than 25 kg are exempt of a register at the corresponding governmental office. Instead, UAVs must be in possession of a fireproof plate that uniquely identifies the UAV as well as the operator.
- 3) It is required that the design and characteristics of the UAV allow a pilot to intervene at any moment. The pilot is the responsible to detect and avoid any collision or danger.
- 4) The operator of the UAV must ensure that all documentation relative to the UAV characteristics and operation is available.
- 5) The operator of the UAV must carry out an aeronautical study about the safety of the UAV operation prior to the flight.
- 6) The operator of the UAV must be in possession of a third party liability insurance that covers possible damages incurred by the drone.
- 7) The operator of the UAV must ensure that communication devices on board of the UAV are in line with telecommunication regulations.
- 8) The operator of the UAV must establish a protection area for people who are not under the pilot control during take-off and landing of UAVs. This protection area must have a minimum radius of 10 m for UAVs that are equipped with vertical take-off and landing capabilities.
- 9) The operator of the UAV must be in possession of a certificate that certifies the theoretical and practical knowledge of the operator to pilot an UAV.
- 10) UAV flights must be carried out during the day under visual meteorological conditions. Night flights require an authorization from the "Aviation Safety State Agency".
- 11) Operators from a foreign country are allowed to carry out experimental flights in Spain under the following two conditions:
 - a. Operators are in possession of a flight certificate from its country of origin.
 - b. The experimental flight was communicated to the "Aviation Safety State Agency".

Activities that have a "research and development" nature, among others, are classified as experimental flights or special operation. For these, additional regulations apply.

Experimental flights and special operations

- 12) For UAVs that have a take-off weight less than 25 kg, the realization of experimental flights must be previously communicated to the “Aviation Safety State Agency”. In particular the following must be communicated:
- Identification data of UAV pilot and of UAV platform.
 - Description of the experimental flight it is going to be carried out, together with a corresponding aeronautical study.
 - Description of the safety measures that will be put in place to guarantee the safety of the operation.
- 13) In order to fly in controlled airspace, a flight plan must be documented and issued to the “Aviation Safety State Agency”.
- 14) Special operations with UAVs less than 10 kg are allowed in areas with a high density of buildings, in areas with a high concentration of people, and in non-controlled air space. Additionally, it is required that the UAV pilot has visual contact with the UAV, and the UAV must fly at a maximum height of 120 m.

3.1 Actions to Comply with Drones Regulation at Final Demo

In order to comply with the regulation that we previously summarized, we explain next the actions that will be taken. We organize these actions in a table.

Table 3-1 Actions to be taken to comply with drones regulation at HEIMDALL final demo

Point 1)	We will fly in an open outdoor space. UAVs will fly at a maximum height of 100 m, and at a distance that permits the pilot to have visual contact with the UAV.
Point 2)	UAVs employed in HEIMDALL weight 9.5 kg, and are identified by a fireproof plate.
Point 3)	Each UAV has a safety pilot, which can control at any time the UAV with a remote controller in case of emergency.
Point 4)	We will carry all documentation relative to the UAV to the final demo.
Point 5)	We will carry out an aeronautical study of the planned flights. This study will be carried out together with HEIMDALL end users to guarantee the safety of the operation.
Point 6)	Our UAVs are in possession of third party liability insurance.
Point 7)	Communication devices on board the UAVs are commercial devices. In addition, we will ensure that the transmitted frequency and power complies with telecommunication regulation.
Point 8)	We will establish a protection area. This action will be coordinated by HEIMDALL end users to guarantee the safety of the operation.
Point 9)	Each of the safety pilots that will participate in HEIMDALL final demo are certified pilots.
Point 10)	The demo will be carried out during day, and only under visual meteorological conditions. In case visual meteorological conditions do not apply, an alternative back up plan will be considered.

Point 11)	Safety pilots are certified pilots in Germany. In addition, the planned flights will be documented and communicated to the “Aviation Safety State Agency”.
Point 12)	The planned flights will be documented and communicated to the “Aviation Safety State Agency”. Required documents will be handed. This action will be conducted in coordination with HEIMDALL end users and Pau Costa Foundation, who organizes the final demonstration.
Point 13)	We will verify whether the area planned for the final demo is a controlled airspace. If this is the case, it will be communicated to the “Aviation Safety State Agency”.
Point 14)	We will fly in an open outdoor space. UAVs will fly at a maximum height of 100 m, and at a distance that permits the pilot to have visual contact with the UAV.

4 Towards a EU Wide Drones Regulation

Common European rules on drone operations will be applicable starting from June 2020. These rules comply with points' outlook in Sec. 3. Therefore no modifications in the system developed in HEIMDALL will need to be carried out to operate the system starting from June 2020.

5 Conclusion

This deliverable analysed the legal implication of the use of drones within HEIMDALL. To this end we defined the actions that shall be taken to carry out the final HEIMDALL demonstration. In addition, we concluded that the common European rules that will be applied from 2020 will not require modification in the drones system proposed in HEIMDALL.

6 References

- [1] Piksi Multi GNSS Module (<https://www.swiftnav.com/piksi-multi>)
- [2] MCU-30 Lite (<https://www.mobilicom.com/mcu-30-lite>)
- [3] DJI S900 frame (<https://www.dji.com/de/spreading-wings-s900>)
- [4] Pixhawk 2 (<http://www.proficnc.com/>)
- [5] Intel NUC (<https://www.intel.es/content/www/es/es/products/boards-kits/nuc.html>)
- [6] Raspberry Pi (<https://www.raspberrypi.org/>)
- [7] Optris PI400 (<https://www.optris.com/thermal-imager-pi400>)
- [8] USB 2.0 board-level camera - mvBlueFOX-MLC (<https://www.matrix-vision.com/USB2.0-single-board-camera-mvbluefox-mlc.html?camera=mvBlueFOX-MLC202bC&selectInterface=Alle&selectMpixels=Alle&selectFps=Alle&selectSensor=Alle&selectColor=Alle&selectSize=Alle&selectShutter=Alle&selectModel=Alle&col=3&row=cmos>)