

Development and Implementation of a Quality Management System for Unmanned Aerial Systems

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Since its origin in the 20s of the past century Unmanned Aerial Systems (UAS) become more and more important in many fields of aviation. Due to the significant advantages towards manned aircraft this technology is especially required for so-called “*dull, dirty and dangerous missions*” in the context of military applications.

Beside the initial use for military/intelligence missions there is also an increasing deployment for civil utilizations such as wildfire management, search and rescue or orthoimagery purposes.

Usually every UAS mission consist out of a pre-processing, processing and post-processing phase, that must be planned and executed accurately, in order to avoid errors that could contribute to mission failure or even crash of the active part within a UAS – the aircraft, which is commonly stated as Unmanned Aerial Vehicle (UAV).

Major goal of this Master thesis research project is the development of a quality management system for UAS missions. It consists out of an analysis of each process within those three phases to provide an approach using checklists as common quality management tool as well as the management of metadata that is required for complete description of performed tasks and obtained sensor data.

The pre-processing phase covers the determination of overall mission constraints and the subsequent UAV flight path definition. The mission constraints can be therefore separated into legal restrictions, terrain- and meteorological threats. Legal restrictions respectively rules of approach must be considered at every mission, especially in the civil field, in which the federal air regulations are crucial. So for example the maximum allowed operation altitude, drop of payload or capturing of aerial images must be clarified with the responsible agencies. After that the flight path definition of the UAV can start by setting starting, en route and landing points with appertaining flight parameters.

The actual processing as follow-up phase deals with execution of mission objectives, which means in general the capturing of data. The UAV can be launched and recovered using different methods such as catapults, bungee ropes or nets. The cruise phase in between of launch and recovery procedure are nowadays mostly inherited by an onboard artificial intelligence or a simple autopilot that navigates the UAV autonomously through the airspace.

Finally, the processes within the post-processing finalize a mission. So the data storage into a specific file system or database structure as well as the analysis and evaluation of obtained data must be handled in a structured way for future use.

These three phases represent an entire workflow of a typical UAS mission. The developed checklists cover therefore the most critical processes within. Using the spatial information management system GeoNetwork opensource provides the possibility to manage these data with help of descriptive metadata.