



Quick Start to UTM

Introduction

The importance of Unmanned Traffic Management (UTM) systems in creating a safer, more effective, and progressive uncrewed aviation environment cannot be overstated. UTM systems are pivotal for meeting local regulatory requirements while promoting innovation and collaboration in the realm of uncrewed aviation. This guide outlines the foundational aspects of UTM, focusing on both its conceptual and technical facets, to foster a comprehensive understanding and implementation strategy. For more on these aspects please see the Primer on UTM.

Conceptual Framework of UTM

At its core, UTM encompasses a set of conceptual regulations designed to ensure the safe and efficient use of airspace. These regulations include, but are not limited to:

- The separation of airspace between uncrewed and crewed aircraft to minimize risks of collision.
- Implementation of one-way corridors to streamline drone traffic and enhance safety.
- Enforcing minimum distances between drones to prevent accidents.

These conceptual guidelines can be established with minimal financial outlay, providing a cost-effective foundation for UTM.

Technical UTM Implementation

The technical aspect of UTM involves real-time monitoring of all drone activities by the Civil Aviation Authority (CAA), necessitating significant technical infrastructure. This system must operate continuously to ensure safety. For crewed aircraft, technical UTM systems are already operational. However, maintaining these systems incurs significant costs, with expenses in Germany reaching approximately 800 million euros annually to manage a maximum of 9,000 airplanes per day. Notably, the number of crewed aircraft is substantially lower compared to the vast quantities of drones, presenting unique financial and operational challenges.

NOTE: A CAA can only rely entirely on a technical UTM solution, if it is guaranteed that all components are working properly 24/7 and all air vehicles have working live tracking devices!

Pathway to Effective UTM

It is likely that it will take well over a decade before technical UTM solutions work 100% like some manufacturers promise today. Nevertheless, the way to establish a reliable UTM can be started today. It is a longer journey and consists of many smaller steps which can be done one after the other. With the experience gained, success and issues can be observed and, improvements made. This phased approach allows for the accumulation of experience, identification and resolution of issues, and continuous improvement based on real-world insights.

This document offers a suggestion on how to move forward today, towards an general UTM solution. The base is to set up the different modules, preferably on a small scale get experience and then roll it out for a larger scale. The process includes actions on both the conceptual and procedural aspects.



A. Steps that can be taken with a conceptual UTM

- **Introduce the conceptual UTM** (separation of the airspace, distance rules, one way drone corridor, no flight zones). For more see this section in the toolkit.
- **Develop a Database with web interface for the registration** of drones, operators and companies. This is very important for the technical UTM later on. So the CAA can contact the operator of a drone if there are issues.
- **Expand the database to include flight authorization.** Enable the operator to upload the planned flight in a digital form (e.g. als KML files). The database will check if there are any violations with no flight zones or interference with other already granted flights, check the track record of the operator/company and then approve the flight. This can save a lot of time for the staff at the CAA. This enables the CAA to more easily contact the drone operator if there are issues or complaints from the population because of improper proper drone operations.
- **Expand the database system to include operational analytics:** Expand the database to analyze drone operations e.g. assess the number of operations, by location, purpose, drone type, indentify the activity hotspots, compare the planned and actual flight paths etc. In addition a track record of each operator can be developed.

B. Steps that can be taken with a Technical UTM

- **Decide on scope this initial testing:** Considering which drones should be managed by the CAA e.g. Assess the necessity to include every small drone, e.g. wedding photographer which fly in low height over private property? For a quick start it may be wise to begin with a small number of drones.
- **Live Tracking:** Technical UTM only works if the drones have live tracking capabilities. So check if the GSM coverage is sufficient, or pursue other means suitable means of live tracking. For more on this see the Tracking section of the toolkit.
- **Procure a system to test within the scope:** Deliberating between open-source and closed-source UTM systems, with considerations for long-term flexibility, cost, and maintenance. Carefully consider the pros and cons for more on this see the resource on this topic in the UTM section of the toolkit.

Steps if selecting an open source UTM

For those considering an open-source UTM, the following steps are recommended:

- **Start with basic features and gradually expand while gaining experience.** For example start with BVLOS drones flying in areas with good GSM coverage, or with drones want to operate near airports or bigger settlements
- **Engage experienced experts to design a flexible and future-proof software framework.** There are quite successful approaches in other countries with open source UTM
- **Emphasize modularity to prevent system-wide failures and facilitate easy module replacement.** This is very important. Single modules can be tested carefully and can be made very reliable. And if the modules are reliable they can be linked with interfaces with others but the failure of one module will not bring the whole system done
- **Clearly define module interfaces** to accommodate potential improvements.
- **Foster local capacity-building** to reduce reliance on external expertise.
- **Collaborate with other countries** to leverage shared experiences and prevent duplication of efforts.



Strategic Considerations

Here are the higher level considerations which have to be carried out for setting up such a complex system which will serve the CAA for many decades.

- Objectives and Priorities:** Identification of specific goals for the UTM system refer to primer for ideas on what to include.
- Survey of Existing Systems:** Review of existing UTM solutions available on the market or as open source solutions.
- Decision on Approach:** Choosing between open-source and closed-source options for the UTM system based on the needs and capabilities of member countries. Determining factor is the willingness to invest into in-house development personnel, see chapter below.
- Technological Basis:** Establishing the core technological framework and developing an initial, pragmatic set of UTM modules for example for operator and drone registration.
- Customization:** Customization of front-end user interfaces and functionalities to meet the specific requirements and regulations of each member country.
- Training and Education:** Implementation of training programs & videos for operators, regulators, and other stakeholders to ensure proficient use of the new UTM system.
- Implementation and Roll-Out:** Deployment of the UTM system across member countries, ensuring compatibility and integration with existing local aviation infrastructure. Awareness campaign for crewed aviation.
- Development Plan for Next Modules:** Outline a roadmap for the development and integration of subsequent modules, based on feedback and evolving needs.
- Continuous Improvement:** Establish mechanisms for ongoing assessment, feedback collection, and system enhancements to adapt to changes in drone technology and regulations and progress through the module priorities.