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Country report on the use of drones in construction-related activities

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1 OVERVIEW (AT NATIONAL LEVEL)

1.1 Regulations (Standard Operating Conditions)

The EU Aviation Basic Regulation ("Basic Regulation") in force since 11.09.2018 now clarifies that unmanned (autonomous) aviation is also part of civil aviation and thus the same basic requirements apply. Specific technical and operational requirements were determined by the Commission as of 1.7.2019 with the following two legal acts:

- Delegated Regulation (EU) 945/2019 on unmanned aircraft systems and third country operators of unmanned aircraft systems (manufacturing rules).
- Implementing Regulation (EU) 947/2019 on the rules and procedures for the operation of unmanned aircraft (operational rules). The regulation is in force since 1.7.2019 and will apply in all member states from 1.7.2020. A transition period with certain conditions applies until 30.6.2022 for unmanned aircraft of the open category that do not meet the requirements of the regulation.

The new rules apply to all parts of drones and are designed to ensure that manufacturers and users across the EU respect safety, privacy, personal data handling and environmental protection. Drones are classified into the following three categories according to the air and ground risk they pose in terms of potential collisions (people, critical infrastructure, other aircraft):

- "Open": low risk, therefore no approval required.
- "Specific": increased risk, approval by national authorities.
- "Certified": high risk, comparable to conventional manned aircraft. However, there are no EASA (European Union Aviation Safety Agency) requirements for this category as yet.

In addition, points were established in the following areas:

- A registration of operators in a database and registration number on the aircraft,
- geosensitization (warning function in case of potential violation of airspace boundaries),
- direct remote identification (including device for aircraft position tracking,
- Use of real-time electronic communications or similar,
- Training or proof of knowledge (remote pilot),
- Establishment of "no-drone zones", i.e. areas where absolutely no drones are allowed (such as airports) by member states.

1.2 Strategic plan for the development of RPAs/drones in the country. Priorities

Among the most important forward-looking technologies are Artificial Intelligence, Internet of Things, Big Data, Blockchain, 5G, 3D printing, robotics, drone technology, genome editing, nanotechnology and photovoltaics.

Communication and interaction with society are supported in a variety of ways within the framework of sponsored projects. Innovation labs are a central instrument for this: One example is "Take Off: Innovation Lab AirLabs" (<https://www.ffg.at/airlabs-austria>) - Establishment and operation of a drone test infrastructure.

The innovation potential of drones is very large, with applications ranging from emergency response (fire/rescue), disaster response, conservation, and infrastructure monitoring.

The variety of possible applications is leading to a sharp increase in drone flights in the airspace and thus to increasing challenges in integrating drones into the airspace.

1.3 Government agencies with jurisdiction over RPAs

Federal Ministry for Climate Action, Environment, Energy, Mobility Innovation and Technology: <https://www.bmk.gv.at/>

Austrocontrol: <https://www.austrocontrol.at/>

Dronespace: <https://www.dronespace.at>

1.4 RPA operator qualification requirements / Pilot certifications needed

The "**Open**" category allows simple low-risk operations without the involvement of aviation authorities, even for commercial purposes. A permit to fly is not required. The category is intended to liberalize the use of drones, thus requiring the gain of experience. The risk to other airspace users is minimized by separating manned and unmanned aviation (e.g., by different flight altitudes). Risk to people on the ground is minimized by using drones with low kinetic energy and by establishing minimum distances to people/crowds. Flights over crowds are prohibited, but flights over uninvolved people in urban areas are allowed. Control in this category is through the executive branch as in normal traffic. Required: license and registered drone (insurance necessary with minimum coverage 750 tsd)

Category “**specific**”: If the risk becomes higher, e.g. if better technical equipment of the drone is necessary for a specific mission or higher pilot competence is required, the category "Specific" comes into question. Here, the rules are stricter. A risk assessment must be submitted by the user for each use. This is reviewed by the aviation authority and the mission is approved on an individual basis. Exceptions are flights in unpopulated areas, where the (already registered) user has to prepare, evaluate and submit the hazard assessment himself. Legal info may approve. Proper documentation of such flights is required. The control in this category is done by the aviation authorities.

The category “**certified**” involves operations with the same or similar risks as in manned aviation. Therefore, the licensing and certification of pilots and drones are as strict as in manned aviation.

1.5 Key figures (n^o of registered operators like corporations, SMEs...; registered aircrafts; ...)

It is estimated that there are already up to 100,000 drones in Austria. This includes both the private and commercial sectors. Sales of drones for commercial use are around 1,500 drones (2021). In 2016, this figure was still around 1,000, an increase of 50% within these 5 years. (source: BRANCHENRADAR.com Marktanalyse GmbH)

Data from austro control: (2021)

- Drone pilot licences: 40.733
- Drone registrations: 27.177

2 INDUSTRY OVERVIEW

2.1 Focus → Related activities linked to RPAs

Drones can be used in processes throughout the whole life cycle of a building. The application areas are divided into three sections

Planning phase

- DTMs (Digital Terrain Model) and DSMs (Digital Surface Models)
- GIS & 3D modelling

Construction phase

- Monitoring construction progress
- Logistics
- Photography for marketing activities

Operation phase

- Measurement (laser scanning)
- Inspections for safety and maintenance
- Thermography
- Fire control

2.2 Developments

The U-space comprises various services and will support the management of safe and efficient drone operation while providing an appropriate interface to manned aviation and ANSPs. Unlocking the advantages of new technologies and incorporating various automated functions will make it possible for large numbers of drones to routinely enter the airspace in complex and crowded areas such as cities. The final stage of development is scheduled for completion in 2035.

The Development of innovative technological solutions and open up new types of applications is the priority of the future tasks. There are numerous projects that are due to be implemented in collaboration with logistics, infrastructure and telecoms providers. The first long-haul flight of an unmanned aircraft without line-of-sight control has already taken place and involved the remote inspection of high voltage power lines for Austrian Power Grid AG. Austrian National Railways (ÖBB) has also tested drones for the first time to check rail infrastructure in areas that are particularly hard to access. Another case, the first fully automated flight by a drone from the Red Cross district office in Lilienfeld to the nearby state

hospital, demonstrates how their use can save valuable time and resources when transporting blood products. (Austrocontrol)

2.3 Sector statistics

See key figures before.

There is no specific data / statistics for each sector available.

2.4 Sector challenges → Technology adoption and gaps (Drone adoption)

The construction industry is probably benefiting most extensively from the new drone applications- in all construction sectors where UAS can provide valuable services. Until a few years ago, for example, inspecting was complex, poorly accessible structures such as slope stabilization or bridges was a time-consuming and expensive process.

The future will change as soon as fully autonomous systems are used and control is no longer required. Corresponding technologies such as LiDAR and image recognition with AI will create new potential. What is difficult at the moment is the safety on the construction sites with all the obstacles.

2.5 Key takeaways from the survey (from companies & professionals)

The construction sector, as well as the facility- and real estate management in our is characterized by small and mid-size companies.

- About 25% of the companies have in-house experts, 40% have external service providers and 35% have currently no demand.
- 90% of the companies, who have in-house experts have between 1 to 4 employees which are involved in the use or management of drones, 10% have 5 to 9 employees.
- 60% of the companies indicate that they use drones occasionally, 30% indicate that they use them rare and 10% have no use.
- 65% of companies indicate that the drone use will become more common in the future, 20% have no estimation and
- The most used drone applications are quality control, progress tracking and communication.
- Photography, measurements, digital modelling and thermal imaging will be developed for future tasks

- According to the companies, the main advantages of using drones are more appealing marketing material
- 30% of the companies indicate that it is somewhat difficult to find qualified professional profiles in the use of drones, and 65% neutral.
- The companies indicate that the solutions to address this lack of skills are the awareness of drone technology, the investing in the upgrading of training centers and the improvement of trainers and providers.
- 70% of the companies indicate that they agree that the establishment of a standardized and certified training program would help promote the use of drones in the different sectors.
- 65% of the companies indicate that they agree that cooperation between the different institutions and companies would reduce the gap between existing training and the real needs of the sector. 25% have no estimation.

3 TRAINING

3.1 Specific training and licensing for RPAS pilots

Category “open”

The drone license is mandatory for all persons who want to fly with drones in the category "open" (subcategories A1, A2, A3) with a weight of 250 grams or more. In most cases, this consists of online training (online course) and an online test of 40 multiple-choice questions. Training and test are provided free of charge by Austro Control and can be completed online at dronespace.at. After positive completion, the drone operator's license can be saved or printed out directly by the operator. The proof must be carried with each flight either electronically (e.g. on the cell phone) or in printed form.

The minimum age for piloting drones with a take-off weight of 250 grams or more and thus for obtaining the drone operator's license is 16 years, although there are some exceptions (e.g. for "toy drones"). Attention, the minimum age for the operator of a drone is 18 years.

The drone pilot's license is valid for five years.

The test for the certificate of knowledge for pilots can be taken in any European country and is valid in all member states. The online test covers topics such as flight safety, human performance skills, operating procedures, general knowledge of unmanned aerial vehicles, insurance, and data protection and privacy.

Depending on the weight (subcategories A1, A2, A3) of the drone, the requirements for pilots vary:

Drones weighing 250 grams or more: online training followed by an online test (40 multiple-choice questions). For all other drones in subcategory A1, it is sufficient to familiarize oneself with the user manual.

For subcategory A3, it is also necessary to familiarize oneself with the user manual and complete online training and online test.

For operation in subcategory A2, flight experience and the passing of a theory test at Austro Control are also required.

Category “specific”

The category "specific" allows flights beyond visual range (BVLOS). Use cases for this category are e.g. camera flights over cities with drones over 4 kg or flying over infrastructure.

An operating license is required for this purpose. The risk assessment (SORA) must be attached to the application. If the operation falls under a so-called "standard scenario" for various typical application scenarios (e.g. inspection wind turbine), the operator does not have to perform a risk assessment anymore, but only has to declare that the operation complies with the corresponding scenario and that the specified requirements are met.

Austro Control confirms that this declaration has been received, after which operation can commence. This is because a risk assessment has already been carried out for the corresponding type of operation within the framework of a "standard scenario" published by the authority and the necessary safety precautions and requirements have been defined.

"Light UAS Operator Certificate"

In the category "specific", a "Light UAS Operator Certificate" (LUC) can also be applied for instead of a single authorization by Austro Control. With the LUC, Austro Control entitles the operator to authorize his or her own flight operations in the category "specific" under certain conditions.

Training of remote pilots

The extent of the required training depends on the planned flight in the category "specific". If the operation does not fall into a "standard scenario", Austro Control will assess in the course of the operating approval whether the training to be proposed by the remote pilot is appropriate and thus make it the required training.

In the case of a "standard scenario", the remote pilot must hold a certificate of theoretical knowledge for operation under standard scenarios and an accreditation for completion of the STS-01 practical skill. In addition, the online exam must be successfully completed.

3.2 Description and comparison of the current training offer

Courses are offered by various providers for theoretical training and also practical flight exercises. Target groups of the courses are mostly users of the category "open". For the flight trainings of the category specific, trainings can be carried out as well.

Special courses for specific application areas are also offered. (Ex. Fire brigade)

Only a few courses are currently available for the construction sector. Only theoretical seminars are offered here. Special courses with regard to the various options are not available.

Training offer

Provider	Infos	Link
Spektakulair	Courses for drone licences (A1-A3) and flight experience	https://spektakulair.at/
Öamtc	Trainings for flight experience	https://www.oamtc.at/
Wifi	Courses for drone pilots (basic & advanced)	https://www.wifi.at
ARS Academy	Seminar using drones for building inspection (theory)	https://ars.at/

3.3 Key takeaways from the survey (from learners/trainees; maybe trainers?)

- The learners have less experience using drones, but understand how they are working (75%).
- The most interesting sectors for their future careers are residential building construction, facilities management, real estate agent and the energy sector.
- Most of them (70%) are not aware of the most in-demand jobs in the construction industry.
- The interesting fields of application are rather broad. The most cases which were selected are , photography, inspection, 3d-modelling and progress monitoring.
- 33% of the learners surveyed indicate that access to drone-related training that matches their interests is somewhat difficult, while another 63% indicate that access is neutral.
- The learners indicate that the main reasons for the lack or difficult access to training related to drones are the slow implementation of new training programs adapted to the new trends in the sector and the lack of skill pathways / training programs.

- The learners indicate that the possible solutions to address this problem of access to training would be the awareness of drone technology and its different applications in construction works and foster open exchange and communication between companies and educational institutions to favour cooperations.
- The learners indicate that the most important aspects for effective learning and subsequent job placement are active practice, relevant and up-to-date learning content, as well as up-to-date equipment and qualified specialised trainers.

4 CONCLUSIONS

In addition to the market of consumer drones, a highly specialized drone technology and industry is developing with a high growth potential. These small aircraft are finding their way into sectors, as in agriculture and forestry, security technology or logistics. The strongest growth, is currently in the area of photography, measurement and analysis services. The advantages of drones are obvious: costly settings such as barriers, scaffolding or days of downtime for scaffolding or days of downtime for measurements and inspections can be saved with their use.

The survey of companies shows that they use drones sporadically. Mostly with external service providers and for the use of photography, as well as construction site monitoring. The survey with the learners shows that they have dealt with the topic, but the application can only be classified to a limited extent. This can exist by the fact that some have not yet dealt with possible courses or training.

For flying, in the different categories training courses are offered for practical training. However, what is missing are trainings with specific application areas, such as the use of different analyses (measurements, thermography..) or software applications in combination with the testing of different drones. In this area, there is a gap in the education.

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