FLYNEX

DRONE OPERATIONS IN ENTERPRISES

INTEGRATION OF DRONES INTO EXISTING PROCESSES

CONTENTS

GLOSSARY

BVLOS Beyond Visual Line Of Sight describes a flight that takes place outside the pilot's visual range.

ConOps Concept of Operations is a document that defines a proposed system's characteristics from the perspective of the future user. Examples are the specification of the business requirements or the specification of the stakeholder requirements.

ERP An Enterprise Resource Planning System Solution supports a company through all levels of the planning of business processes.

HMI HMI is the interface between man and technology.

MTOW The maximum take-off weight describes the maximum weight of a flying object for it being able to take off.

OEM An OEM is a manufacturer or a producer of original equipment.

POC Proof of concept. New products will be developed and tested in consideration of real market development. Economic calculations, market, and competition monitoring are taken into account.

SAAS The Software as a service model is a sales model. It is based on the principle that software and IT infrastructures are operated by an IT service provider and can be used as a service.

SORA Specific Operations Risk Assessment is a European risk assessor for the operation of unmanned aerial vehicles.

SOP Standard Operating Procedure is a process description.
All processes are strictly documented.

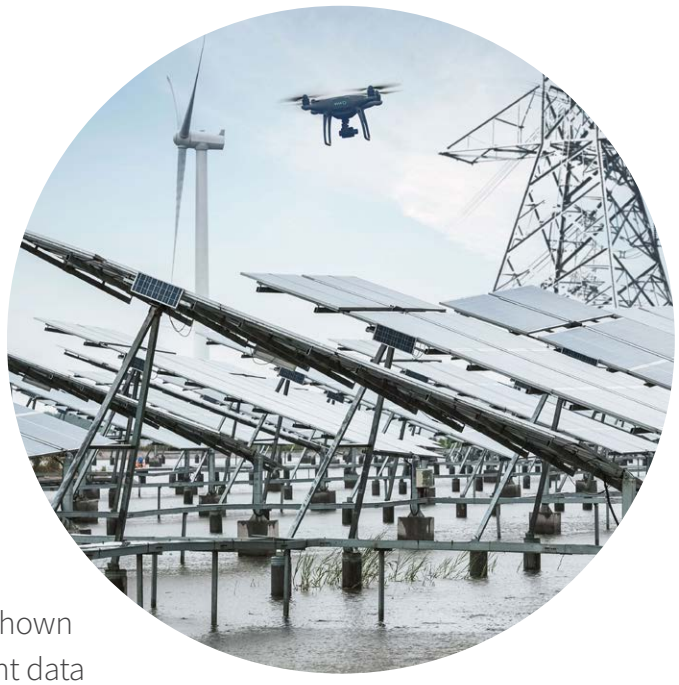
VLOS Visual Line Of Sight describes a flight that takes place within the pilot's visual range.

1. DRONES AS TOOLS

Unmanned aircraft systems are tools that perform (partially) automated tasks. Currently, 90% of these tasks involve data collection using optronic sensor technology installed as a payload on the UAV. This makes it possible to work three-dimensionally and dynamically in space. The main advantage of using UAVs is the reduction of operational costs of mostly more than 80%. At the same time, the quality of output factors and entire processes can be increased. However, the results strongly depend on the respective application in the corresponding industry and on the specified goals to be achieved with the technology.

1.1 THE CHALLENGE

The industry can‘t use drones effortlessly and for specific applications without certain processes. Companies in all industries face the challenge of understanding and applying aerospace processes. This relates to high expenditure. Integrating the technology, including complete systems, personnel, and training, is expensive and requires high follow-up investments as product life cycles become shorter. Understanding that every application and take-off is entirely different, depending on the intended use, is essential. They, therefore, require unique solutions, also depending on the industry. The drone itself is relatively useless without the appropriate procedures. However, companies have often had unsatisfying



experiences since the processes of the customer‘s value chain have not been appropriately addressed. Experience has shown that the industry only needs usable, relevant data that is ideal for meeting a specific need.

1.2 THE SOLUTION

The key to an economically viable and valuable deployment of unmanned aircraft systems is not the technology in use. The secret lies in the processes and workflows between the customer and the service provider, which are aligned to the value chain and integrate planning, implementation, and analysis effectively. Aviation-specific integration must adapt to the needs of the respective industry. The flight must be based on the required data. Finally, the data must be prepared for industry-specific use. Only if the industry-specific requirements are transformed into specific, measurable, and controllable flight plans drones can be used as a tool appropriately.

1.3 ACCESS TO AIRSPACE FOR COMPANIES

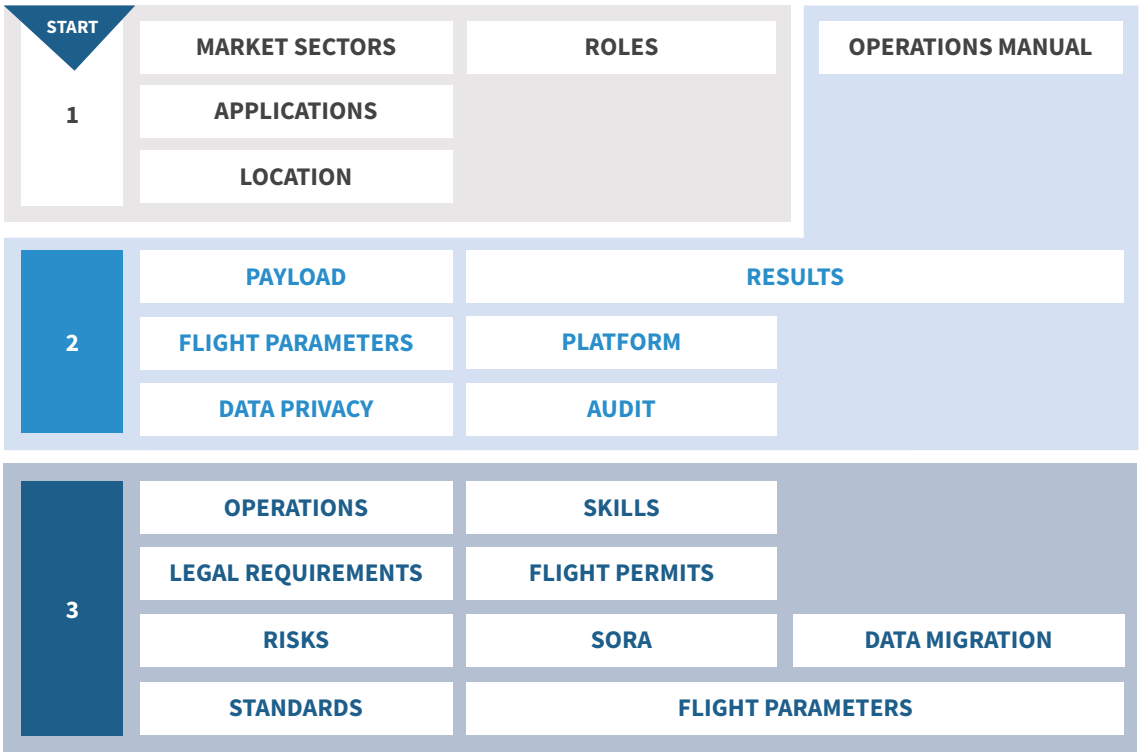
FlyNex enables the integration of unmanned aircraft systems for industrial applications and scalable embedding in existing value chains. For this purpose, we provide a platform that allows software-based automation of drone missions, ensures the connection to data collection devices, and transfers the collected data via pre-configured interfaces to analysis applications. This data-based added value is achieved in different phases via individual components of the FlyNex Platform.

2. PHASES OF INTEGRATION

2.1 IDENTIFY MARKET SECTOR

To integrate unmanned aircraft systems into companies in a targeted and economically value-adding manner, it is crucial to identify the market sector distinctly. The requirements for drones are based on the needs and conditions of the respective sectors.

In particular, the use in the real estate industry will have different requirements than in agriculture. General usage will only be feasible in very few cases due to the various applications within different industries and markets. At least 30 different markets can currently be identified, although there are hardly any industries in which an application is not conceivable.



Phases of integration of unmanned aircraft systems into companies

AGRICULTURE	ENVIRONMENTAL PROTECTION	PUBLIC SAFETY
TRANSMISSION	HUMANITARIAN AID	AUTHORITIES AND ORGANIZATIONS WITH SECURITY TASKS
JOURNALISM	RESEARCH	EDUCATION
AUDIO VISUALIZATION	INSURANCE	LOGISTICS
REAL ESTATE	INDUSTRY	TRANSPORTATION
FISHING	MAINTENANCE	LEGAL SYSTEM
MEDIA	METEOROLOGY	TOURISM
CONSTRUCTION INDUSTRY	MINING	SPORTS
MARKETING	SURVEYING	ENERGY
FORESTRY	MANUFACTURING	MEDICINE

Market sectors for the deployment of unmanned aircraft systems

2.2 DEFINING THE USE CASE

Within a market sector, it is of crucial importance to define the exact purpose of use. The intended use can range from dismantling, dosing, filming, mapping, monitoring to delivery and so on. It is advisable to describe the activity using one or more verbs precisely. Companies should, therefore, ask themselves which actions the drone should perform or support.

It can be useful to quantify the intended use or to classify it spatially to derive conclusions in the later integration process. Especially regarding the operational procedures, this has an impact. It makes a difference whether the drone is to be used several times for a similar activity within the same room or for individual projects in changing rooms.

ADVERTISE	**ACCESS**	**SAVE**
TRANSMIT	**IDENTIFY**	**MARK**
FILM	**INSPECT**	**TRANSPORT**
RECORD	**LOCALIZE**	**RESEARCH**
DETER	**MAP**	**SCAN**
DOCUMENT	**SURVEY**	**TRACK**
DOSE	**MEASURE**	**SPRAY**
OUTPUT	**MONITOR**	**TEST**
APPLY	**OBSERVE**	**DROP**
EXPLORE	**PLACE**	**PHOTOGRAPH**

Operating purposes defined by the field of activity for unmanned aircraft systems

2.3 DEFINING THE ROLE

The drone-operating company will need to decide what role it wants to play as a market participant to exploit the full potential of a proposed drone application. Many companies underestimate the effort and expense involved and assume that they will be able to carry out all necessary measures by themselves. They often fail due to the complexity of the respective value chain. Therefore, only a few companies can act as a „full-service company“ by using extensive resources.

It is advisable to take on a role in the market close to the respective company‘s core competencies. For example, it may be appropriate to play a role in data generation or analysis using unmanned flights. Supporting roles in service functions are also conceivable and have proven to be successful. The company does not have to have its own unmanned aircraft systems. It may well be sufficient for a company to merely take on the role of a customer and purchase drone pilots or equipment externally.

FULL-SERVICE PROVIDER	SOFTWARE PROVIDER	AUTHORITY
PROJECT MANAGER	EXPERT	PROJECT PARTNER
PLANNER	INTERMEDIARY	CERTIFIER
TECHNICAL PROVIDER	TRAINER	DATA ADVOCATES
MANUFACTURER	CONSULTANT	SPECIAL USER
ANALYST	CUSTOMER	APPRAISER
DATA PROCESSOR	DISTRIBUTION PARTNER	MARKETER
OBJECT MANAGER	PROPERTY OWNER	

Roles within the value chain of unmanned aircraft systems

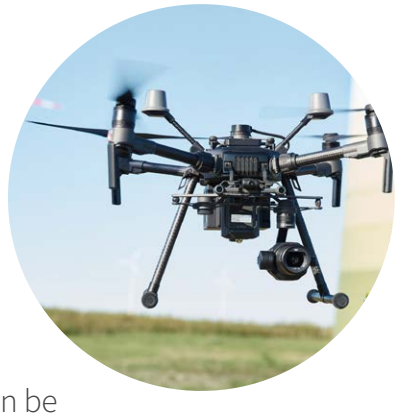
2.4 OPERATIONS MANUAL

Creating, maintaining, and updating a manual is essential for the operational use of unmanned aerial vehicles. The manual provides the basis for the employees for their training as well as for them to fulfill safety and documentation obligations. It contains all processes and procedures used in the company to define and document aviation law and safety-relevant requirements as well as business-operational requirements.

Currently, the Operational Manual is not yet widely observed in German legislation, but it has long been a standard for international companies. It is primarily based on the company's fundamental role that wants to use drones on the market and is strongly influenced by the parameters of the technologies used.

2.5 PAYLOAD

More important than the actual aircraft is the payload to be used for the intended purpose. The payload determines the outcome of the operation and, consequently, defines the deployed aircraft requirements and the resulting flight parameters. Therefore, it is important to always ask for the appropriate payload to achieve a relevant and usable result, preferably before the aircraft is decided upon.



2.6 FLIGHT PARAMETERS

The drone itself only forms the technical system that carries the deployed payload. In combination, the purpose and the payload determine the parameters to be provided by the aircraft. This way, the aim is fulfilled, and the result can be utilized. The flight parameters then include MTOW (Maximum Take-off Weight), flight time, altitude, and speed, as well as redundant positioning and drive systems or, e.g., electronic stabilization software. For example, it is highly relevant for the application whether a rotor device, a fixed-wing aircraft, or a hybrid device will be used.

2.7 DATA PROTECTION

Regardless of the respective payload (e.g., transport boxes or sensors such as cameras, ultrasonic measuring heads, etc.), the data protection regulations must be observed for their respective applications and their respective flights.

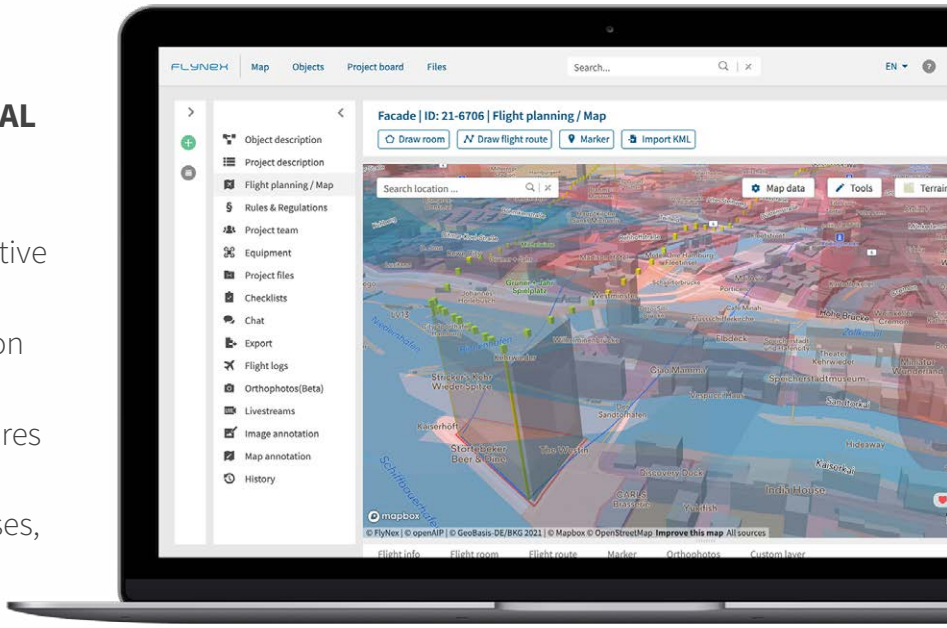
The following must be observed:
The use of airspace does not violate data protection regulations. Furthermore, the use of airspace does not serve the purpose of targeted observation and/or recording persons unless the persons concerned have given their written consent. So, it does not invade the physical area of third parties' private life (e.g., personal rights, copyright). According to specific national regulations, such as the Art Copyright Act in Germany, it is stipulated that pictures may not be distributed or made publicly accessible without consent.

Thus, if a person can be identified on a photograph from whom no consent has been obtained, this constitutes a violation of the right to one's picture. Even in the case of flights, e.g., over residential areas where terraces or gardens are photographed, these areas represent privacy and are protected by general personal rights. There are currently no common guidelines for this, except that valid data protection regulations must be met for every flight. For this purpose, current practice requires a data protection declaration for a take-off, without these being specified in detail in the following. Flights can be subject to data protection check.

Therefore, it is recommended that these points be laid down in the Operational Manual for the company and published under the future European Data Protection Regulation.

2.8 THIRD-PARTY INDUSTRIAL PROPERTY RIGHTS

This goes hand in hand with respect for third parties' protective rights, particularly the right to informational self-determination and privacy protection. To this end, standardized test procedures should also be created for the company's operational processes, which should be laid down in the Operational Manual.

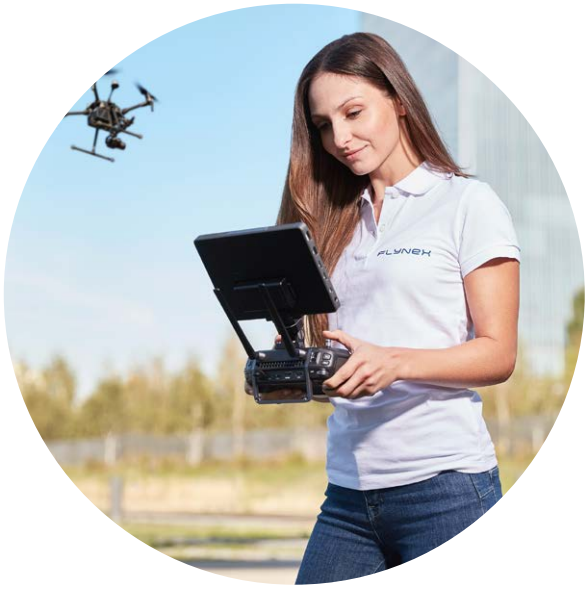


These test procedures must be functionally designed so that each time a data collection process occurs, it is ensured that third parties' property rights are not affected. These procedures must also be applied to flights within a factory site.

2.9 OPERATIONS

As a basis for the applied payloads and the drone, the operational procedures and types of deployment shall be defined, with which the desired, relevant results can be achieved. The specific operating procedures depend on spatial and environmental conditions, technical possibilities, and personnel capabilities. It is not only important whether it is a VLOS (Visual Line of Sight) flight and a spatially based flight or a BVLOS (Beyond Visual Line of Sight) flight and a route-based flight. For the respective application, all parameters, factors, and procedures must be defined according to altitude, speed, angle, spatial procedures, flight routes, fail-safe, etc. in order to integrate a reproducible solution for all data acquisition via a drone.

The sum of all procedures must always be reflected in a concrete ConOp (Concept of Operations) or corresponding guidelines for the respective application.



2.10 BUILDING SKILLS

Once the procedures of a mission have been defined, the necessary skills must be built up in the company. For a full-service company, this may require staff to be trained for various functions. These may include pilots, operational managers, or data protection officers. As a result, companies must also build up the necessary infrastructure skills, for example, to handle the required planning, documentation, asset management, or data distribution.

FlyNex offers all components in a pre-integrated platform solution in the form of the FlyNex Enterprise Suite. On the one hand, flight routes can be planned digitally based on current maps, and geoinformation, routes and areas can be measured, waypoints can be set and then transmitted to the provided drone.

The necessary interfaces for transmitting flight data to the drone are accordingly configured so there is no break between the planning and the flight systems used. Within the planning process, guidelines can be created in the form of tasks/checklists for the pilot. Using integrated asset management, the device (i.e., the drone) and a pilot can be assigned in the planning phase. Operational managers can thus determine crucial aspects of the flight at the beginning of the planning phase.

In the subsequent phase of data processing of the data collected during the flight, in-house software solutions can be used. Pre-defined interfaces are available for this purpose, which seamlessly close the transfer from the drone or cloud storage to data processing. The FlyNex Platform enables the phases of planning, flight, and analysis to be mapped within a single process.

2.11 LEGAL REQUIREMENTS

Each application of unmanned aircraft systems is subject to legal requirements. This means that companies must deal with the requirements of aviation law and the associated implementing regulations. De facto, every company becomes an air carrier, even if the operational procedures have little to do with publicly known aviation.

Within the legal embedding framework, companies must, in addition to the operational procedures, fulfill the regulatory requirements through measures in the Operational Manual. Especially in flight preparation measures, processes are often required that enable a company to obtain the necessary clearances for a flight despite existing bans. A phased plan is often helpful here, transforming the regulatory project management into recurring processes in the respective ConOp.

2.12 PERMISSION PROCEDURE

Within the regulatory management of a flight, the required approval procedures must be documented. The obtaining of approvals from property owners, permits, exceptions, or air traffic control clearances should be considered in creating a ConOp (Concept of Operations). The ConOp is a prerequisite for obtaining the permits. The approval procedures should be included as an annex to the Operational Manual.

FlyNex offers an approval service to obtain flight permits directly from the relevant authorities. During repetitive process management, outsourcing approval procedures can save time and personnel resources in the long run.

2.13 RISK ANALYSIS

To obtain a permit or authorization for specific flights, it may be necessary to submit a risk analysis. In the future, it will be mandatory for flights under certain conditions to prepare a risk analysis before take-off to determine the associated risk and, if necessary, to initiate risk minimization measures. The risk analysis must be included as an integral part of the company's operational manual.

2.14 SORA

SORA is the international term for the risk analysis required to determine risk values and define risk minimization measures. Methodically, the „Bow Tie Method" forms the basis of this procedure. Both risk values on the ground and in the air are determined, and requirements are derived. Preventive and damage-limiting measures are determined in sequence, which in turn are listed in the Operational Manual. SORA is also necessary for obtaining official flight approvals.

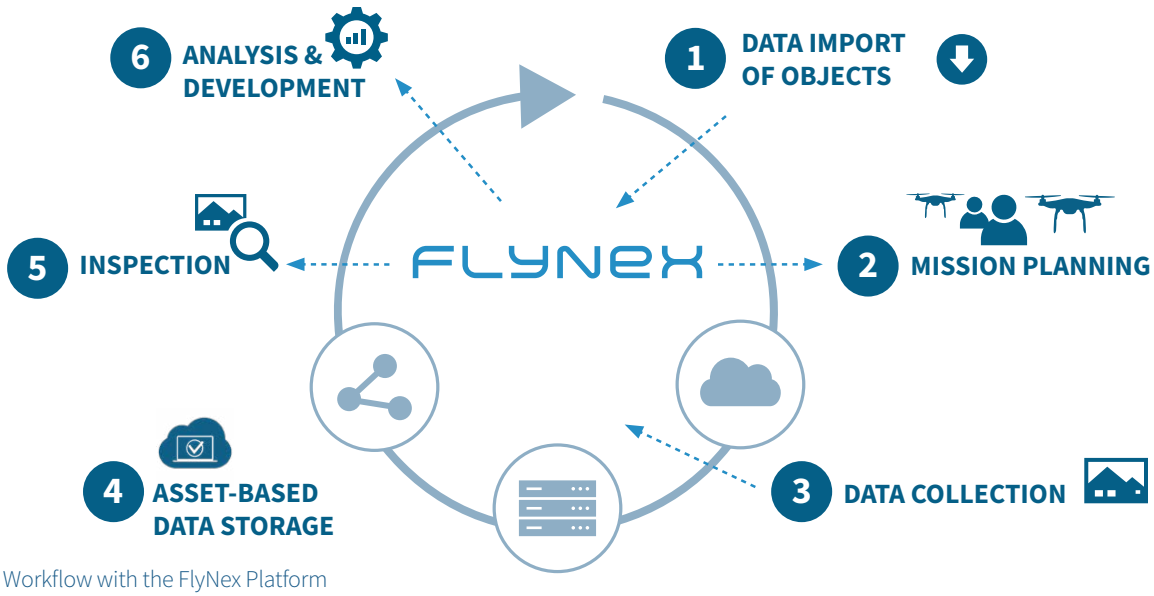
2.15 STANDARDS

From the phases presented in simplified form, a PoC (Proof of Concept) must be derived and carried out after the elaboration to collect practical feedback. This feedback serves not only to evaluate the PoC but also to adopt proven procedures and processes in order to develop Standard Operating Procedures (SOPs) for the company. These SOPs subsequently enable the application to be reproducible and scalable for use within a market sector. The application can thus be transferred to regular operations. A business model can be created as a result, and the SOPs should be moved to the Operational Manual.

2.16 WORKFLOW

Once these phases of integration have been completed, the specific application can be thoroughly described in detail using the value chain. A standardized, automated workflow can now be implemented entirely for the use of the unmanned aircraft system. Ultimately, repeatable deployments can achieve corresponding economies of scale in terms of costs, time, planning, and data evaluation.

The FlyNex Platform provides an integrated workflow to control all phases of the flight, from planning to analysis and distribution. The precise definition of the workflow contributes to mastering it, which is accelerated by increasing automation. This reflects the successful economic implementation of a drone into operational routines.



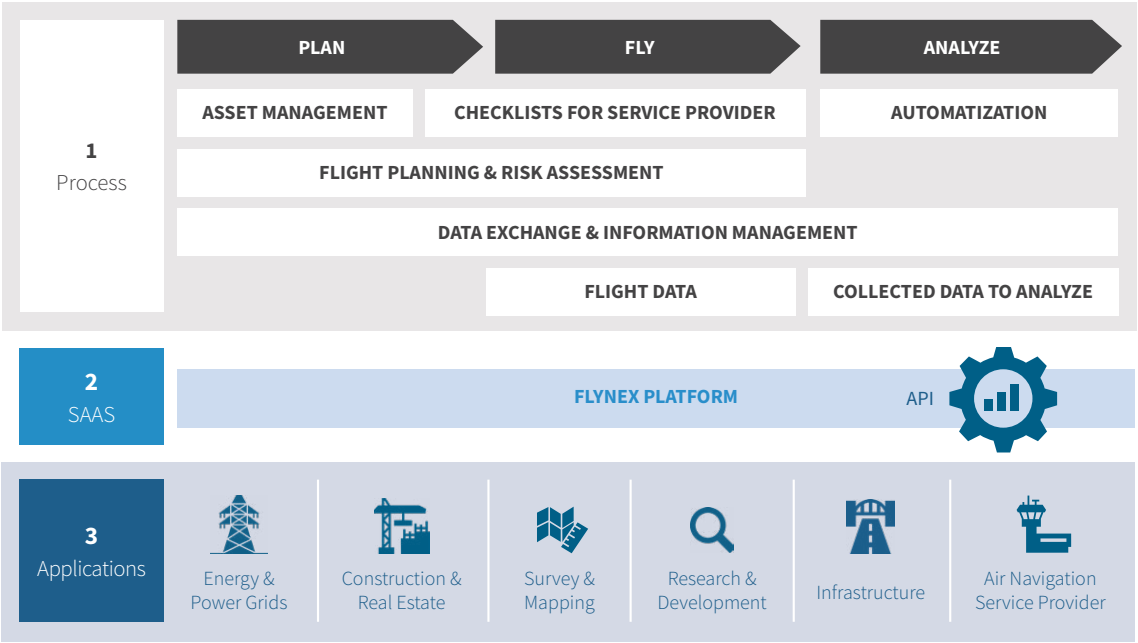
Workflow with the FlyNex Platform

3. IMPLEMENTATION

3.1 IMPLEMENTATION IN COMPANIES

The implementation of unmanned aircraft systems into companies requires preparation, which involves a consideration of the current value chains. In addition to the phase-by-phase-consideration of the integration process, it is also necessary to examine parallel processes in the company (professional qualification of employees, technical maintenance and set-up work for equipment, official approvals, etc.). Furthermore, this must be adapted to the changing value chains due to increasing digitalization.

However, individual aspects must also be considered in relation to future applications. For example, requirements for pilots, equipment, and payload for different flights may be relevant in the context of procurement. Also, the later integration of own or third-party services (analysis tools, database connectivity) or into an existing ERP, should be known in advance.



Scheme of digital integration with interfaces within a company

The digitalization strategy of the company must, therefore, not be neglected. This often leads to the need for individual company implementations and, above all, software-supported integration of drones into a company. This can be done based on modular solutions or adjusted to the needs using SaaS (Software-as-a-Service).

The FlyNex Platform was modularly developed to ensure that software and hardware connections between the planning interface, drone, service, and other data endpoints are compatible and flexible.

Appropriate interfaces can guarantee integration into existing environments and processes. This includes interfaces to OEMs, services, and third-party applications via implemented connectors. The FlyNex Platform ensures the compatibility, data security, and south-/northbound integration of the drone within the overall architecture.

3.2 TECHNOLOGY PARTNERS

For a complete integration, which considers all aspects of unmanned aerial systems, it is advisable to rely on technology partners. These partners must have both the necessary technical and operational know-how for the desired application and the ability to carry out the technical implementation in product development and platform integration and provide long-term support for the company.

With the FlyNex Enterprise Suite, we have developed a solution geared to the technical, organizational, and operational requirements of a company.

CONTACT US,
if you need support with the integration, have questions,
or want to know details about the FlyNex Platform
(by mail: contact@flynex.de or by phone: **+49 (0) 341 331 760).**

FLYNEX

FlyNex, based in **Leipzig, Hamburg, Rotenburg** and **San Francisco,** is the leading software solution for commercial drone projects. Through its cloud platform, FlyNex covers the full range of commercial applications for data collection by unmanned aerial systems.

Its solution enables companies and organizations to digitally capture thousands of assets, facilities, and buildings using drones. The complete integration of drones and Artificial Intelligence helps companies not only to collect data but also to analyze it automatically.

FlyNex is successfully used as a drone and data management solution by renowned companies and technology leaders in the construction, real estate, energy, and telecommunications sectors. In addition, FlyNex is involved in innovation projects across Europe for the successful integration of drones, e.g., for medical transport, intelligent air traffic management, or air cab navigation.

More info at: https://www.flynex.io/

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