

Unmanned Aerial Systems

Solutions for industry, infrastructure,
agriculture and emergency response

FRONTIER BASE SYSTEMS LIMITED

Hong Kong · Shenzhen · Kyrgyzstan · Uzbekistan · Türkiye

Modern Unmanned Aerial Systems

Unmanned Aerial Systems (UAS) have become a key tool for digital transformation across industry, infrastructure, agriculture and emergency response. UAS enable real-time monitoring of large territories, high-precision geospatial data collection, thermal and multispectral surveying, and security of critical infrastructure.

Frontier Base Systems supplies fixed-wing and multirotor UAS, professional electro-optical payloads, and provides system integration services tailored to the needs of clients in Kyrgyzstan, Uzbekistan and Türkiye.

Industry applications

Oil & Gas industry

UAS are highly effective for facility monitoring and detection of third-party activity to ensure safe operation of trunk pipelines, prompt identification of equipment damage including oil and petroleum product spills on land and water, and thermal inspection of oil & gas facilities. UAS are also used to produce orthophotomaps, digital terrain models, and to identify the development of hazardous geological processes.

- Detection of third-party activity in pipeline protection zones
- Prompt identification of equipment damage, including oil and petroleum product spills on land and water
- Facility monitoring and incident analysis
- Production of orthophotomaps and digital terrain models
- Thermal inspection of oil & gas industry facilities
- Airborne laser scanning
- Identification of hazardous geological processes and assessment of their impact on safe pipeline operation

Emergency response and rescue operations

UAS are highly effective in searching for distressed crews of aircraft and maritime vessels, locating missing persons in remote terrain, identifying avalanche victims, and guiding mobile search teams. They are used to determine precise coordinates of emergency zone boundaries and search objects, mark emergency control zones, and notify the population. UAS provide communications relay, security for mass events, and control of transport routes.

- Search for distressed crews of aircraft and maritime vessels
- Search for missing persons in remote and hard-to-access terrain
- Determination of precise coordinates of emergency zone boundaries, communications relay during emergencies, public notification
- Measurements in chemical and radiological accident zones

- Search for avalanche victims
- Monitoring of wildfire and flood conditions
- Security of mass public events
- Guidance and coordination of mobile search teams
- Environmental monitoring
- Investigative operations support

Overhead power line monitoring

UAS are used to assess the condition and determine the coordinates of wires, cables, line hardware, towers and insulation. The system is applied to identify potentially hazardous trees, assess clearing and right-of-way expansion requirements, detect structures, and monitor work execution within protection zones.

- Determination of coordinates of wires, cables and line hardware
- Assessment of volumes and parameters for clearing and right-of-way expansion
- Inspection of towers and insulation
- Detection of wire sag and measurement of clearance from wires to ground
- Identification of hazardous trees and other objects posing potential risk
- Supervision of work execution within protection zones

Forestry and Agriculture

Fixed-wing UAS are used for monitoring and management of large forested and agricultural territories. In forestry they support early wildfire detection, post-fire damage assessment, forest health monitoring, inventory of natural and planted stands, and oversight of reforestation programs. In agriculture they enable crop monitoring, aerial livestock counts, and coordination of farm machinery — from sowing through harvest.

- Early wildfire detection using thermal imaging — localization of hot spots before open flame appears
- Active fire monitoring: mapping of fire front, wind-driven spread direction, identification of safe approaches for ground crews
- Post-fire damage assessment and planning of restoration measures
- Forest health monitoring: detection of pest infestations, disease outbreaks and dieback zones
- Aerial photography for forest inventory and mapping of natural and planted stands
- Production of orthophotomaps and digital terrain models of forested areas
- Monitoring of reforestation, afforestation and anti-desertification programs
- Inventory of timber stockpiles and assessment of harvested volumes
- Planning of forest road networks and harvest schemes with allocation of protected zones to preserve biodiversity
- Aerial wildlife counts and anti-poaching surveillance
- Monitoring of protected natural areas and conservation zones
- Crop monitoring through the full growing season and coordination of farm machinery

Construction and Land Management

UAS provide high-precision data at every stage of infrastructure project lifecycle — design, reconstruction, construction and operation. UAS are used to produce orthophotomaps, digital terrain models, topographic plans and maps, and remain operational on any terrain regardless of relief or remoteness. They are applied to collect up-to-date data for cadastral records and correct cadastral errors, as well as to detect unauthorized construction, land seizures and unsanctioned changes to land plot boundaries.

- Production of orthophotomaps, digital terrain models, and creation of digital twins
- Collection of up-to-date data for cadastral records and correction of cadastral errors
- Airborne laser scanning and aerial photography for comparison of as-built structures with design models, including BIM models, at any construction stage from foundation to utility installation
- Point cloud classification
- Detection of unauthorized construction, land seizures and unsanctioned boundary changes
- Production of maps and plans, including topographic maps
- Construction progress monitoring with 3D models, identification of deviations from project documentation and on-site violations

Gold mining and mineral extraction industry

UAS have become a critically important tool for the modern mining industry. Drones enable regular mine surveying, monitoring of open pits and dumps, inspection of tailings storage facilities, equipment inspection and perimeter security. UAS deployment significantly reduces the time required for geodata collection, improves worker safety through remote inspection of hazardous areas, and lowers extraction costs. Solutions are particularly in demand at mining and processing complexes in Kyrgyzstan and Uzbekistan, where regular monitoring of large open-pit operations and tailings dams is required.

- Mine surveying of open pits: orthophotomaps and digital elevation models (DEM, DSM) with centimeter-level accuracy
- Volume calculation of extracted rock, ore stockpiles and waste dumps, real-time inventory of reserves
- Monitoring of pit wall, slope and bench stability — early detection of cracks, displacements and signs of collapse
- Inspection of tailings storage facilities and dams: detection of leaks, seepage, and signs of structural instability
- Thermal inspection of equipment: detection of overheating, wear and faults in conveyors, pump stations and processing units
- 3D modeling for blast planning and rock fragmentation optimization
- Geological exploration and ore body search using magnetometers and spectrometers
- Environmental monitoring: air quality control, detection of acid mine drainage indicators, assessment of adjacent ecosystems
- Perimeter security: 24/7 monitoring of restricted zones, detection of unauthorized access
- Personnel safety: remote inspection of hard-to-access and hazardous areas without on-site presence
- Reclamation documentation: monitoring of land restoration after site closure

Technological capabilities

Real-time video and thermal monitoring

The use of UAS for video monitoring enables real-time control of facilities at long distances and rapid situational assessment. This is particularly relevant in scenarios requiring fast response — emergency situations, environmental monitoring, or infrastructure patrol. Our UAS are equipped with modern electro-optical systems that deliver high-quality video imagery in both daytime and nighttime conditions.

01**Environmental monitoring**

Observation of ecosystem conditions, detection of emergencies and planning of response measures.

02**Prevention of unauthorized activity**

Real-time monitoring of territories to detect illegal activity and ensure infrastructure security.

03**Search and rescue support**

Support of emergency response services during rescue operations.

Multispectral imaging

Multispectral imaging makes it possible to assess vegetation quality on the land surface and is a key tool for improving crop yields and agricultural product quality. Multispectral camera surveys combined with subsequent data analysis produce vegetation indices, which form the basis for plant condition assessment, growth verification and yield potential analysis.

01**Effective at every growth stage**

Multispectral imaging provides key information during preparation for the sowing campaign, at all stages of crop growth, and during harvest preparation.

02**Geo-referencing and positioning accuracy**

Image geo-referencing with up to 1 cm accuracy, registration of images in a defined coordinate system.

03**Higher yields and profitability**

Delivery of quantitative and qualitative yield indicators through highly accurate data.

Five key advantages of fixed-wing UAS

Modern agriculture and industry are actively adopting digital technologies, and fixed-wing Unmanned Aerial Systems (UAS) have become an integral part of this process. These platforms help solve a wide range of tasks — from field monitoring to inspection of industrial infrastructure. Thanks to their unique characteristics, fixed-wing UAS are especially in demand wherever large area coverage is required: in large farms, at mining operations, and during inspection of extensive linear assets.

1. Time savings

One of the key advantages of fixed-wing UAS is their ability to rapidly cover large areas. Unlike traditional monitoring methods, drones can survey hundreds of hectares within hours. This is particularly important during critical periods — sowing and harvesting campaigns, operational control of open pits after blasting, and inspection of pipeline and power line routes following natural disasters. Built-in sensors and cameras enable UAS to collect data in real time, allowing rapid identification of problem zones.

2. Cost reduction

Fixed-wing UAS significantly reduce operating costs. In agriculture — through optimized use of fertilizers, water and crop protection agents via precision application. In industry — through reduced costs for manual inspections, surveying work and infrastructure assessment. Process automation reduces reliance on manual labor. Over the long term, UAS investments pay off through lower operating expenses.

3. Improved data accuracy

Modern UAS are equipped with advanced sensors and cameras that ensure high data collection accuracy. They enable NDVI (Normalized Difference Vegetation Index) analysis to assess plant health and identify stress zones. For mining and construction sites — high-precision photogrammetry with geo-referencing down to 1 cm, 3D terrain modeling and point cloud generation.

4. Long flight endurance and large-area coverage

Fixed-wing UAS have a significant advantage over multirotor platforms thanks to long flight endurance and the ability to cover large territories in a single mission. A single flight of a fixed-wing drone can cover several hundred hectares. This makes them ideal for monitoring large farms, forests, pastures, extensive linear assets, and mining sites.

5. Resistance to electronic interference and spoofing

UAS operations may be affected by external threats such as radio-electronic interference and GPS spoofing. Modern UAS supplied by Frontier Base Systems are equipped with interference-resistant communications and redundant control channels, enabling continued mission execution even in a contested radio environment.

Spoofing — the substitution of GPS signals — can lead to navigation errors, accumulating drift in the inertial navigation system (INS) and difficult landings. The fixed-wing UAS in

our portfolio are equipped with optical navigation systems that use preloaded terrain maps. The system compares imagery with the actual terrain and corrects INS operation, allowing the mission to continue even when GPS navigation is lost. If the link is permanently lost, the UAS automatically returns to the launch point, minimizing the risk of equipment loss.

Regional focus

Kyrgyzstan — mining, pastures and mountain ecosystems

Kyrgyzstan's mining sector is one of the key application areas for UAS. Drones automate surveying at gold and rare-metal extraction sites, monitor the stability of pit walls and benches, track the condition of tailings storage facilities and dams, ensure personnel safety, and provide perimeter control of restricted zones. UAS are also effective for monitoring high-altitude pastures and the country's unique walnut-fruit and juniper forests — including wildfire early detection, anti-poaching surveillance, and assessment of forest health.

- Mine surveying of open pits and volume calculation
- Tailings storage monitoring and environmental control
- Thermal inspection of processing equipment
- Perimeter security of mining facilities
- Monitoring of high-altitude pastures and aerial livestock counts
- Protection of walnut-fruit and juniper mountain forests — wildfire detection and anti-poaching surveillance
- Inspection of roads and mining infrastructure

Uzbekistan — precision agriculture, oil & gas and desert afforestation

Uzbekistan's agricultural sector is the region's largest consumer of precision farming technologies. UAS provide multispectral monitoring of cotton, fruit and grain crops, control of irrigation systems, identification of water stress zones, germination assessment and yield forecasting. In parallel, UAS are deployed in the oil & gas sector and to support the country's large-scale afforestation and anti-desertification programs, including monitoring of saxaul plantings and tugai floodplain forests.

- Multispectral monitoring of agricultural crops and NDVI calculation
- Irrigation system control and water consumption analysis
- Yield forecasting and optimization of farm machinery operations
- Trunk pipeline monitoring and protection zone control
- Thermal inspection of oil & gas infrastructure
- Monitoring of afforestation programs, saxaul plantings and tugai forests
- Topographic surveying and cadastral records

Türkiye — infrastructure, forestry and digital supply chain

The Turkish market is focused on large infrastructure and construction projects. UAS are used to document construction progress, compare as-built volumes with BIM models, monitor trunk power lines and highways, and inspect bridges and industrial facilities.

Türkiye's extensive forest cover — nearly 30% of national territory — creates strong demand for forestry applications: early wildfire detection across Mediterranean and Aegean regions, post-fire damage assessment, and timber inventory across state forest holdings. UAS also support logistics oversight of freight flows, monitoring of warehouse complexes, and port terminal operations.

- 3D modeling of construction sites and comparison with BIM projects
- Construction progress monitoring and deviation detection
- Wildfire early detection and active fire monitoring across forested regions
- Forest inventory and timber stockpile volume assessment
- Inspection of power lines and trunk highways
- Thermal inspection of industrial facilities, bridges and ports
- Monitoring of warehouse complexes and logistics terminals
- Digital documentation for supply chain oversight

Let's match a UAS solution to your task

Frontier Base Systems supplies Unmanned Aerial Systems, professional electro-optical payloads, and comprehensive system integration solutions. Our engineers help select the optimal configuration for specific customer tasks — from mine surveying to crop monitoring and infrastructure inspection.

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