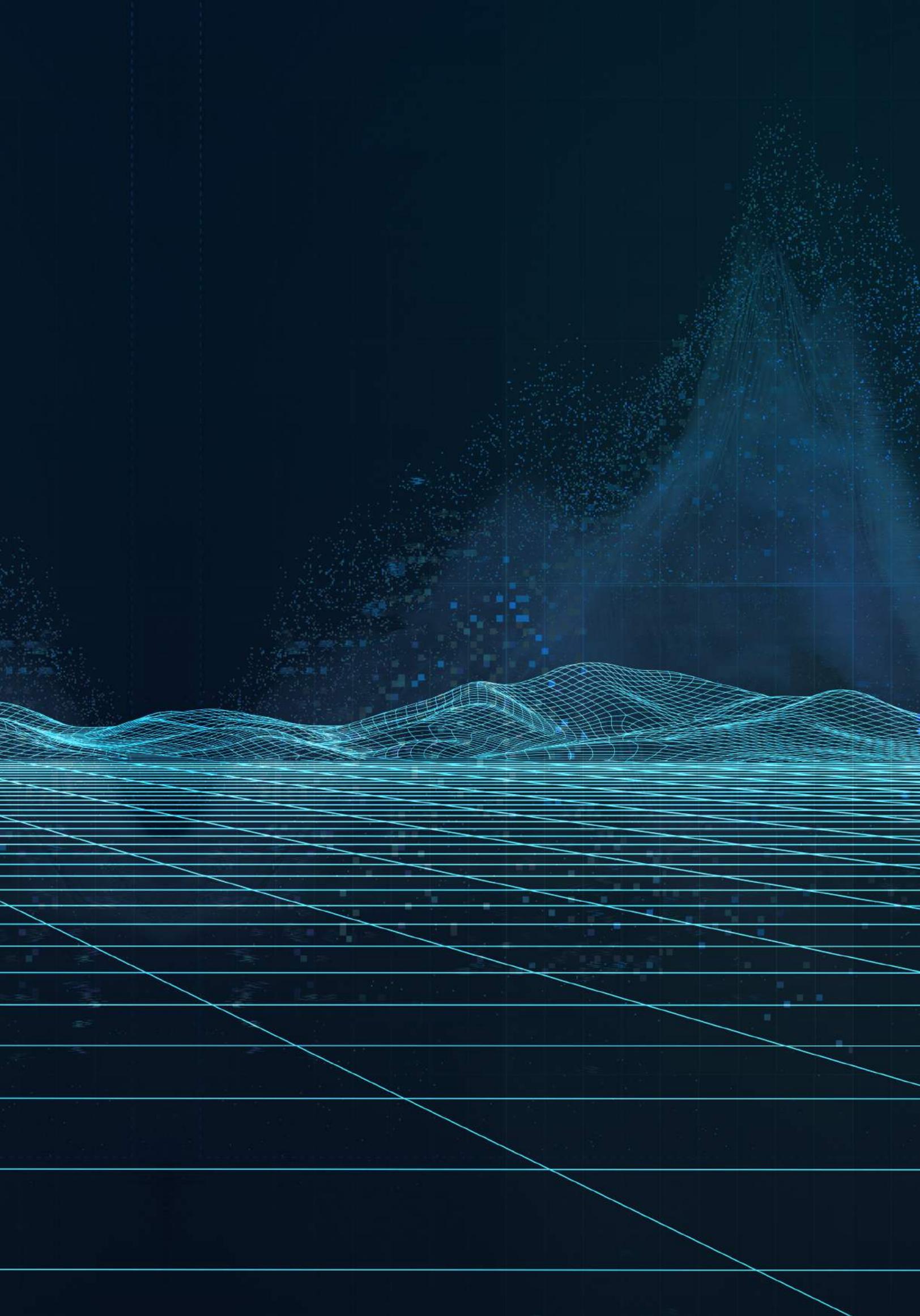


TACTICAL MINI UAV SYSTEMS







STM Savunma Teknolojileri, Mühendislik ve Ticaret A.Ş.

STM was established in 1991 for the provision of project management, system engineering and consultancy services to the Defense Industry Agency (SSB) and the Turkish Armed Forces (TAF).

The SSB continues to be the majority shareholder in the company, which has a workforce of 850 people, 63 percent of whom are engineers.

STM is among the leading companies operating in the defense sector, and is engaged in projects, particularly in the fields of naval platforms, tactical mini UAV systems, cybersecurity and IT services, command and control projects, satellite technologies, military aviation, radar and electronic warfare, and procurement and consultancy services.

Aside from its involvement in many national projects being conducted by the Turkish defence sector, STM is also engaged in export and business development activities for NATO with operations in more than 30 countries.

In addition to acting as the main subcontractor in the MiLGEM Project for the development of Türkiye's first national corvette, STM is also carrying out the detailed design as the main contractor in the project for the construction of TCG İSTANBUL (F-515), Türkiye's first national frigate.

STM has undertaken important tasks in submarine modernization and construction projects for the Turkish Navy, and is also responsible for Türkiye's first submarine modernization export, taking the lead role in the Pakistan AGOSTA 90B project.

STM developed KARGU, Türkiye's first indigenous attack UAV System, and launched Türkiye's first Cyber Fusion Center in 2016.

Through the INTEL-FS2 Project, STM ensures the flow of intelligence between all NATO headquarters around the world, and is successfully engaged in one of Türkiye's largest software exports to the Organization.

STM diversifies its technology-based activities to meet the needs of the public and private sectors – in particular those related to the Turkish defense sector.

STM is headquartered in Ankara, the capital of Türkiye, and continues its operations out of nine facilities, located in İstanbul, Gölcük and Ankara, as well as Pakistan.

STM was for three consecutive years listed on the Defense News Top 100 list of the world's top 100 defense companies.



KARGU

Combat Proven Rotary Wing Loitering Munition System

KARGU is a portable, rotary wing loitering munition system designed to provide tactical ISR and precision strike capabilities for ground troops.

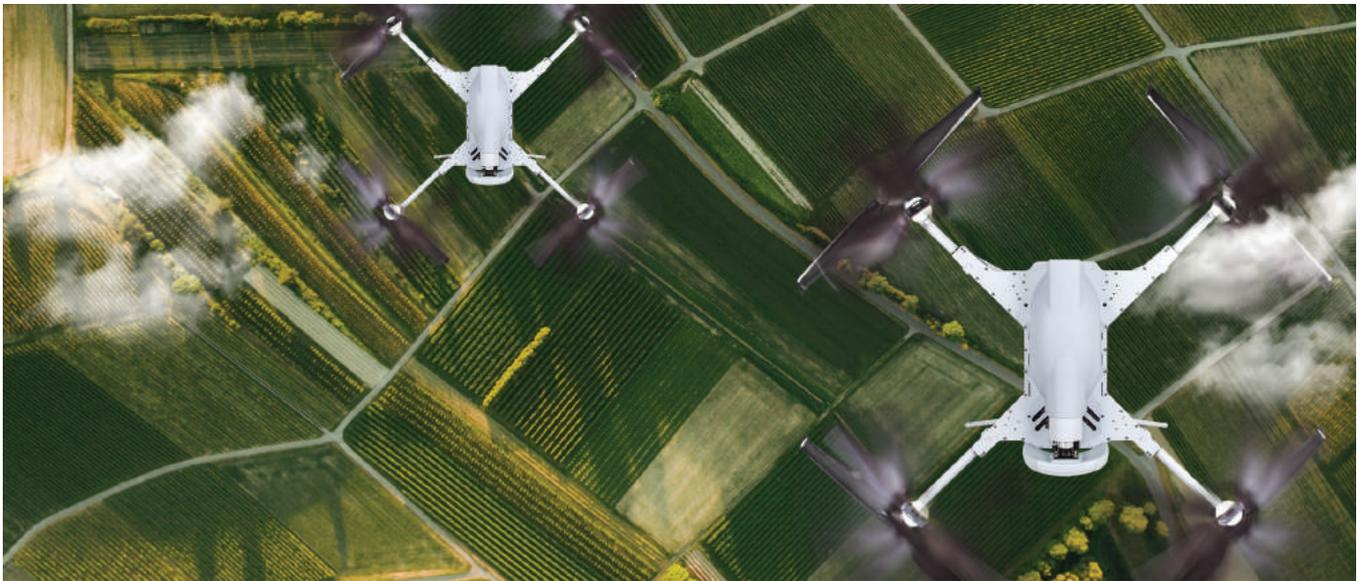
KARGU is capable of performing mission which is planned in STM's ground control station software.

The platform is able to perform precision strike with low signature for beyond line of sight targets.

Precision strike mission is performed as Man-in-the-Loop principle.

The platform is capable of detecting and striking stationary or moving targets with high precision during day and night conditions.

The KARGU system contains Air Platform, Mobile Ground Control Station, supportive equipment and documentation.



CAPABILITIES | COMPETENCIES

- Combat proven
- Vertical Takeoff and Landing
- Fast preparation time, less than 1 minute.
- Day & Night Mission Capability
- Beyond Line of Sight Precision Strike with minimum collateral damage
- Low RCS (Radar Cross Section) Platform Design
- Multiple Warhead Options
- Optical Guidance and Target Tracking
- High performance navigation and flight control system
- Operable by single personnel
- Mission abort and return home capabilities
- Proximity fuse
- Automatic Target Recognition System

TECHNICAL SPECIFICATIONS 1 - MECHANICAL SPECS AND FLIGHT PERFORMANCE

Dimensions (Unfolded, propellers excluded)	707x707x409 mm (LxWxH)
Folded (propellers included)	471x463x210 mm (LxWxH)
Diagonal Wheelbase	1000 mm
Geometric Configuration	Quad (4 Motors)
Takeoff Weight Electrooptical Payload	7.6 kg
Takeoff Weight Thermal Payload	7.8 kg
Endurance with payloads	30 min
Maximum Flight Altitude	3000 m MSL
Cruise Speed	72 km/h
Wind Resistance	10 m/s
Operating Temperature	-20°C to 50°C (-4°F to 122° F)
Battery Charging Time	60 minutes

TECHNICAL SPECIFICATIONS 2 - DATA LINK

Control Distance	10 km (with external antenna) 6.5 km with onboard GCS antenna
Security	AES-256

TECHNICAL SPECIFICATIONS 3 - IMAGING SYSTEM

Electro-optical camera Image Resolution	HD 720p
Electro-optical camera optical zoom	10x
Gimbal	2 axes stabilization, pitch axes control
Thermal camera image resolution	640x400

TECHNICAL SPECIFICATIONS 4 - GROUND CONTROL UNIT

Tablet	10.1 inch touch screen
Joystick	Yes
Working Time With Battery	2 hours
Communication	Internal and external antenna

TECHNICAL SPECIFICATIONS 5 - WARHEAD

Fuse Type	Access
Weight	1.4 kg
Bullets	840 pieces 4mm fragmentation effect



KARGU

TACTICAL MINI UAV SYSTEMS



ALPAGU

Fixed Wing Loitering Munition System

ALPAGU Fixed-Wing Autonomous Tactical Attack UAV is designed for both reconnaissance and surveillance and for striking targets outside the line of sight with high accuracy, can be carried by a single soldier, and can operate autonomously or with remote control.

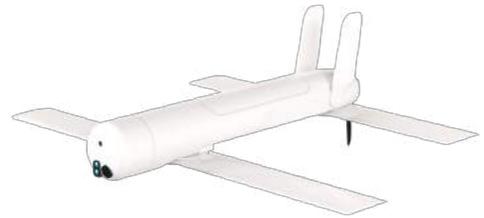
ALPAGU can be effectively used day and night against fixed or moving targets with the help of embedded and real-time image processing and deep learning algorithms that we have developed with national facilities.

The system is comprised of “Fixed-Wing Smart Ammunition System”, Launcher” and “Ground Control Station” components.



CAPABILITIES | COMPETENCIES

- Reliable Day and Night Operation
- Tracking Moving Targets
- High Performance Navigation, Flight Control and Guidance Algorithms
- Deployable and Operable by Single Soldier
- In-Flight Mission Abort and Emergency Self-Destruction Modes
- Advanced and Indigenous Electronic Ammunition Safety, Arm and Trigger Systems
- Indigenous National Embedded Hardware and Software
- Wide Lateral View Angle
- Image Processing-Based Control Applications
- Ground vehicle mountable multiple launcher option



LAUNCHER SPECIFICATIONS

Launch Method	Gas Generator
Dimensions	860mm x 170mm 150mm

PLATFORM SPECIFICATIONS

Control Distance	8km (LOS)
Security	AES-256
Endurance	15min
Weight	1950gr
Cruise Speed	21 m/s
Max Speed	28 m/s
Operating Altitude	120m (AGL)
Flight Altitude	80m - 200m (AGL)
Wingspan	883 mm
Diameter	105 mm
Lenght	653 mm
Vision	EO/IR Camera
Warhead	270 gr
Wind Resistance in Flight	12 m/s
Operating Temperature	-20 C, +40 C

GROUND CONTROL STATION SPECIFICATIONS

Screen	11.6 inç
Communication	Internal and External Antenna
Network	Mesh Network
Control	Control of multiple Alpagu Platform Simultaneously





TOGAN

Multi-Rotor UAS for Tactical Surveillance and Reconnaissance

TOGAN is a multi-rotor UAS designed to carry on tactical surveillance and reconnaissance missions.

TOGAN incorporates a payload using a 30x zoom lens, enabling imaging of distant targets and threats.

TOGAN employs advanced image processing capabilities, enabling the detection and classification of threats that are difficult to spot with human eye.

TOGAN is capable of tracking and following fast moving objects.

TOGAN is able to estimate the coordinates of visible targets, which can then be forwarded to a nearby KARGU ground control station for planning a precision strike.

A secondary Togan platform can be commanded to take over the mission being executed by the primary one, enabling uninterrupted surveillance.

The Togan system consists of air platform, mobile ground control station, supportive equipments and documentation.



CAPABILITIES | COMPETENCIES

- Vertical takeoff and landing
- Fast preparation time (less than 1 minute)
- Day & night mission capability
- Low RCS (Radar Cross Section) platform design
- High performance navigation and flight control system
- Operable by single personnel
- Mission planning and autonomous mission execution
- Mission abort and return home capabilities
- 30x optical zoom capability
- Advanced image processing capabilities, including:
 - o Moving Object Detection
 - o Object Classification
 - o Digital Image Stabilization
 - o Object Tracking
- Ability to follow moving targets
- Target coordinate estimation
- Interoperability with KARGU, aiding recognition of threats & targets and enhancing tactical situational awareness
- Automatic mission take-over capability, enabling uninterrupted surveillance
- Ability to take off from / land on land vehicles

TECHNICAL SPECIFICATIONS 1 - MECHANICAL AND FLIGHT FEATURES

Foldable arms Dimensions (Unfolded, propellers excluded)	711x711x410 mm (LxWxH)
Dimensions (Folded, propellers included)	500x450x410 mm (LxWxH)
Diagonal Wheelbase	929 mm
Geometric Configuration	Quadrotor
Maximum Take Off Weight	Less than 7500 grams
Endurance	45 min
Maximum Flight Altitude	3300m (MSL) / 1000m (AGL)
Max Cruise Speed	72 km/h
Wind Resistance	10 m/s
Operating Temperature	-20°C to 50°C (-4°F to 122° F)
Battery Charging Time	80 minutes / 35 minutes (boost charge)



TECHNICAL SPECIFICATIONS 2 - DATA LINK

Control Distance	10 km (with external antenna) 6.5 km with onboard Ground Control Station antenna
Security	AES-256

TECHNICAL SPECIFICATIONS 3 - IMAGING SYSTEM

Electro-optical camera Image Resolution	Full HD 1080p
Electro-optical camera optical zoom	30x
Thermal camera image resolution	640x480
Gimbal	3 axes stabilization, pitch and yaw axes control

TECHNICAL SPECIFICATIONS 4 - GROUND CONTROL STATION

Tablet	10.1 inch touch screen
Joystick	Yes
Working Time With Battery	2 hours
Communication	Internal and (optional) external antenna



KERKES

KERKES is the capability that enables rotary-wing and fixed-wing unmanned aerial vehicle platforms to perform missions in environments without GPS and RF access. With the KERKES capability, navigation is performed by estimating the location without GPS data in the operational environment. In addition, UAVs can perform missions when RF communication is not possible.

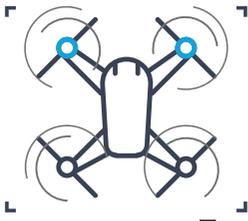
CAPABILITIES

- Feature extraction
- Landmark recognition
- Artificial intelligence and machine learning
- Location Estimation without the support of GPS
- Mission execution without the support of GPS
- Navigation with object recognition and deep learning



KERKES





BUMİN

UAVs with swarm intelligence are systems that can act autonomously, learn, decide, and fulfill the mission given as a swarm within the scope of asymmetric warfare or anti-terrorism. These systems have advanced functions such as real-time object detection, identification and tracking with deep learning based computer vision techniques.

With the ability of BUMİN, rotary and fixed wing platforms, especially the unmanned aerial vehicles within our company, have that the capability of fulfill the mission as a swarm. R&D and productization activities such as testing and adapting existing products and technologies and developing new algorithms are continuing.

CAPABILITIES

- Swarm Intelligence Algorithms
- Central/Distributed Communication Infrastructure
- UAV to UAV Communication
- Formation Capability
- Targeting and Prioritisation
- Target Sharing
- Ability to Sense and Avoid
- Rotation Capability
- Swarm Attack
- Guidance Ability





BOYGA

Multi-Rotor Combat UAS with Mortar Payload

Boyga is designed to be used in the tactical area, in order to drop a 81 mm mortar to the target from air.

Boyga carries a 81 mm mortar and drop the mortar to the target which is selected by the Boyga user.

It has a ballistic estimation algorithm that helps the user to see where the mortar will hit on the ground.

The user can drop the mortar manually, after seeing the hit point indicator.

The user can select a GNSS coordinate to be hit by the mortar.

The user can select an object from the camera video, and with the object tracker, Boyga drops the mortar to the selected object.

The Boyga system contains Air Platform, Mobile Ground Control Station, supportive equipments and documentation.



CAPABILITIES | COMPETENCIES

- Vertical Takeoff and Landing
- Fast preparation time, less than 1 minute.
- Beyond Line of Sight Strike
- Low RCS (Radar Cross Section) Platform Design
- Optical Target Tracking
- High performance navigation and flight control system
- Operable by single personnel
- Mission abort and return home capabilities
- Safety drop mechanism design
- Coordinate attack and ballistic position estimation algorithm

TECHNICAL SPECIFICATIONS 1 - MECHANICAL AND FLIGHT FEATURES

Detachable arms Dimensions (With arms, propellers excluded)	900x900x510 mm (LxWxH)
Dimensions (Without arms, propellers included)	550x500x510 mm (LxWxH)
Diagonal Wheelbase	1150 mm
Geometric Configuration	Quadrotor
Maximum Take Off Weight	17kg (With 81mm munition)
Endurance	30 mins
Maximum Flight Altitude	3000 m MSL
Cruise Speed	54 km/h
Wind Resistance	10 m/s
Operating Temperature	-20°C to 50°C (-4°F to 122° F)
Battery Charging Time	80 minutes



TECHNICAL SPECIFICATIONS 2 - DATA LINK

Control Distance	10 km (with external antenna) 6.5 km with onboard GCS antenna
Security	AES-256

TECHNICAL SPECIFICATIONS 3 - IMAGING SYSTEM

Electro-optical camera Image Resolution	HD 720p
Electro-optical camera optical zoom	10x
Gimbal	2 axes stabilization, pitch axes control

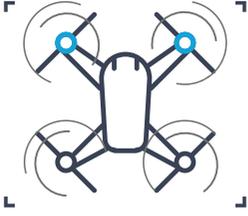
TECHNICAL SPECIFICATIONS 4 - GROUND CONTROL UNIT

Tablet	10.1 inch touch screen
Joystick	Yes
Working Time With Battery	2 hours
Communication	Internal and external antenna

TECHNICAL SPECIFICATIONS 5 - WARHEAD

Mortar type	81 mm
Fuse Type	Electro-Mechanical
Safety System	Mortar begin active just after drop command No physical connection between mortar fuse and drop mechanism before drop command.
Weight	1.8 kg
Bullets	1300 pieces 5mm fragmentation effect

BOYCA
AMMUNITION DROP UAV



ALPAGUT

Smart Loitering Munition System

ALPAGUT, which can be operated day or night, is effective against mobile or stationary land and sea targets, radar and communication systems, critical facilities, personnel and targets of opportunity.

ALPAGUT can be used in single or swarm configurations with an operational radius of 60 kilometers, an operational time more than 60 minutes and different types of warheads.

Once fired or released, the system will enter into target detection, tracking and evaluation mode, hovering in the air and the onboard TV/IIR seeker feeds the real time video image to the operator. ALPAGUT then attacks the identified target after obtaining user approval from the ground autonomously.

ALPAGUT can detect and recognize targets with its EO/IR sensor without being noticed or affected by jamming systems. The target can be pinpointed with an onboard guidance-control system. In addition to all these features, the system also offers significant advantages to its users through its fire and forget ability with the capability of mission update during fly, and its rapid integration into manned and unmanned land/air/sea vehicles.

ALPAGUT, the Smart Loitering Ammunition System, is being developed in cooperation with STM and ROKETSAN.



CAPABILITIES:

- Reliable Day and Night Operation
- Precision strike
- Tracking Moving Targets
- High Performance Navigation, Flight Control and Guidance Algorithms
- In-Flight Mission Abort and Emergency Self-Destruction Modes
- Indigenous National Embedded Hardware and Software
- Image Processing-Based Control Applications
- Image data assisted navigation under GPS Denied conditions



Technical Features	
Operating Range	60+ km
Endurance	60+ mins
Warhead	11 km High Explosive Blast Fragmentation, Armour Piercing and Thermobaric Warhead Options
Weight	55 kg
Height	2.3 m
Target Set	Mobile and Stationary Air Defence Systems, Radar or Communication Systems, Command Centers, Light Armoured Land Vehicles, etc.
Integrated Air Platforms	MALE and HALE class UAVs, Fixed wing aircraft, attack and general purpose helicopters (i.e. AKINCI, TB-3, AKSUNGUR, ANKA, Hürkuş, ATAK-2, GÖKBEY)
Integrated Land Platforms	Land Vehicles, Unmanned Land Vehicles
Integrated Naval Platforms	Surface Vessels, Unmanned Sea Vehicles



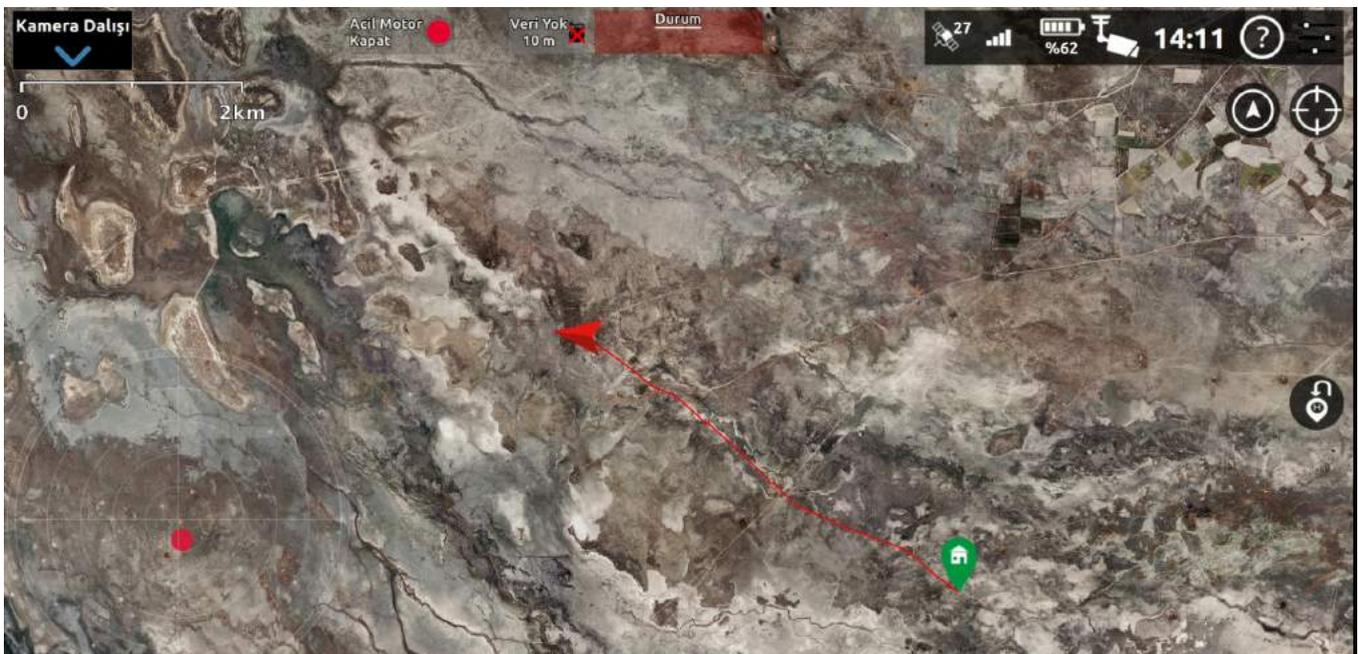


STM RF SEEKER PAYLOAD

RF Seeker Payload for Mini/Micro or Small Class UAV

STM RF Seeker Payload, is a passive wideband sensor that allows mini/micro or small class UAV platforms to detect and track RF transmissions belonging to friend and foe systems. **STM RF Seeker Payload** works integrated with the STM KARGU platform, which has successfully proven itself in the field in domestic and international missions.





Specifications

- Wide Frequency Coverage
- Automatic Gain Control
- Guidance on Fixed or Moving Target
- Hom-on-Jam
- Automatic Target Selection Capability
- Lightweight Design
- Non-Moving Parts
- Low Power Consumption
- Platform Independent Integration

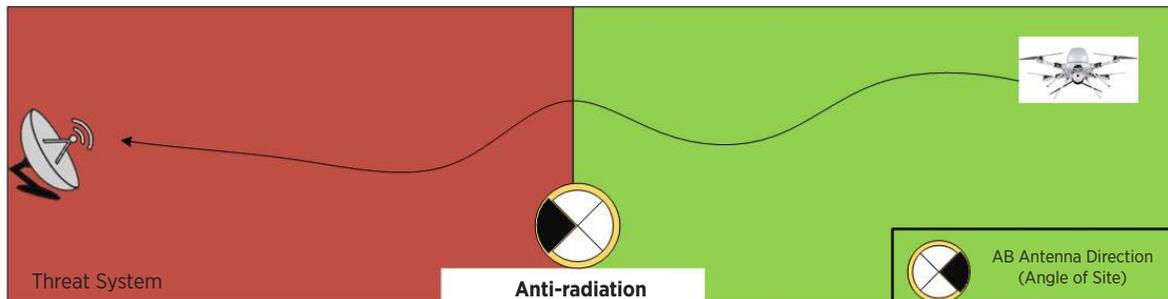


Single Sensor Multi-Use

STM RF Seeker Payload provides cost-effective electronic warfare capabilities to the platforms.

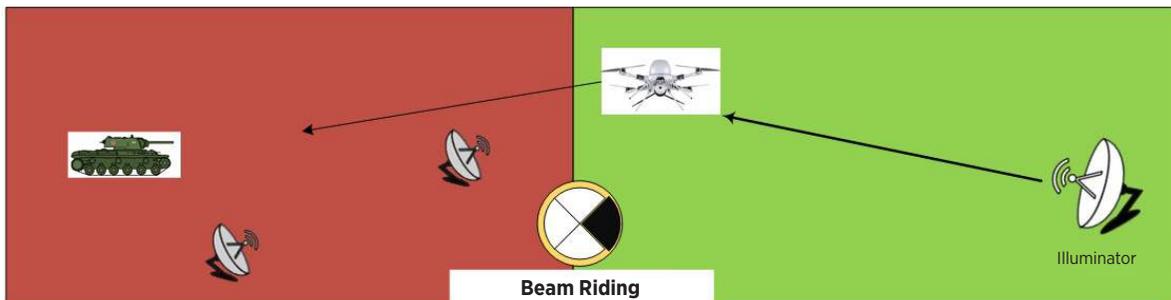
Anti-Radiation Mode

- Detection and Tracking of enemy RF transmissions
- Guidance on Enemy RF transmission



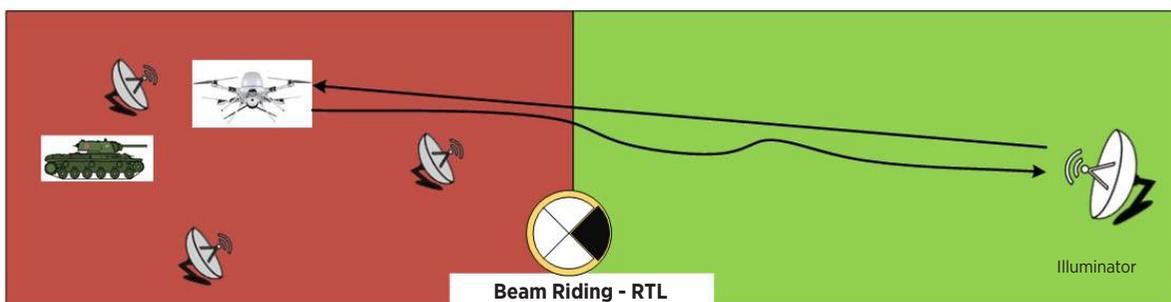
Beam Riding Mode

- Detection and Tracking of Friendly RF transmission
- Ride on friendly beam
- Engagement Superiority against enemy jamming



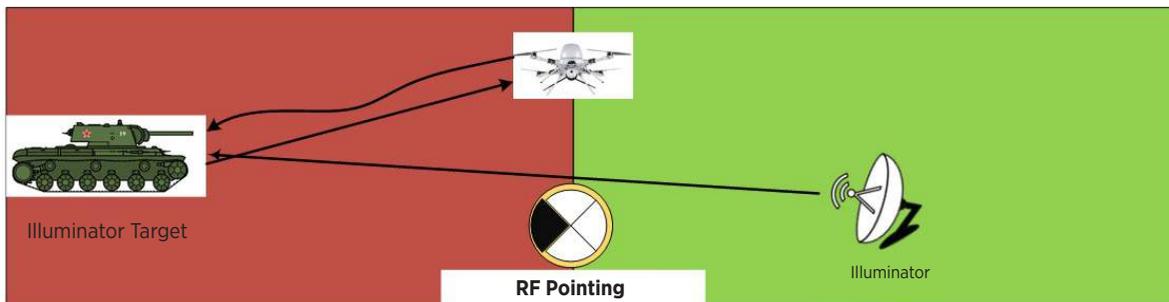
Beam Riding - Return to Land

- Detection and Tracking of Friendly RF transmission
- Ride on friendly beam to safely return to land



RF Pointing Mode

- Illumination of the enemy element
- Detection and Tracking of return echo
- Guidance on return echo



STM RF Seeker Payload Technical Specifications

TECHNICAL SPECIFICATION	VALUE
Operating Frequency	V/UHF
Channel	4
Sensitivity	-110 dBm
Monitoring	Yes
Automatic Gain Control	Yes
SFDR	60 dB
GVD-based programming	Yes
Automatic Target Selection	Yes
User-Assisted Target Selection In The Air	Yes
Compatible with fixed or rotary wing platforms	Yes

STM SAVUNMA TEKNOLOJİLERİ MÜHENDİSLİK VE TİCARET A.Ş.

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