



NORN



ELECTRONPRYLAD
AESTHETICS IN THE DETAILS





**NORN**

PJSC "Scientific and Technical Complex "Electronprylad" was established in 1962 based on the Automated Control Systems Department of Antonov ASTC. The company is engaged in research and development activities aimed at designing, manufacturing, and testing experimental and serial products, as well as maintenance and modernization of flight data recorders with special software, aircraft and engine regulation and control systems, indicators, modules, etc.

In early 2024, as a result of the previous year's research and development work of the company's leading specialists, a specialized Research and Development Department for the development of UAV onboard equipment was established. During this time, the department has developed and successfully implemented a number of models of attack FPV drones that have already been tested. The project is called NORN and is represented by such models of attack drones as:

- ◆ "NORN 7M"
- ◆ "NORN 8M"
- ◆ "NORN 9M"
- ◆ "NORN 10M"

These UAV models are adaptable to different tasks and conditions. Their small dimensions allow them to lift **1.4 kg, 2 kg, 2.5 kg, and 3.2 kg** of loading and fly about **15 km** (in favourable conditions). These models are equipped with a video transmitter with **2.5 W** power, which allows to have a sufficiently stable signal in the area of EW operation.

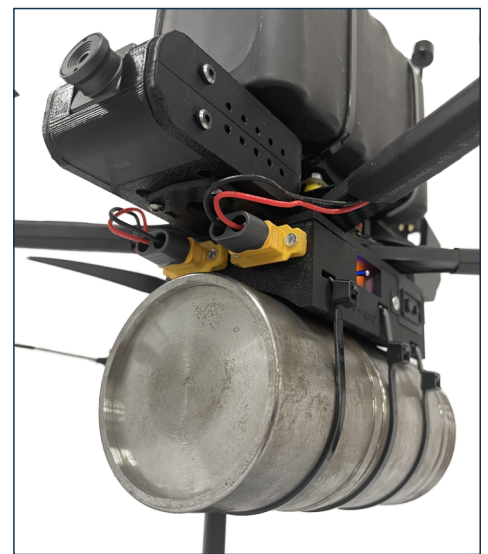
These UAVs can operate in the range of standard and shifted frequencies, **720-1020 MHz**.

The hardware complex allows the drone to change its control frequency before departure with the help of the NSU in less than 3 minutes. To ensure optimal operation of the control system, the drone is supplied with a set of quick-replaceable antennas operating in the frequency bands that are most optimal for the selected drone control mode.

These UAVs can adjust the video frequency on the fly using the Radiomaster Boxer. We have presets available for video frequencies at **4.9, 5.3, 5.6, 5.8, and 6.0 GHz**.

All four drone models are equipped with three types of cameras as an option: a daytime, light-sensitive (twilight), and thermal imaging camera with an incoming video processing module.

The drones are supplied with an optimal battery assembly using high-quality cells, with a capacity of **8400 mAh** and **12600 mAh**, respectively.





PRODUCT SPECIFICATIONS

TECHNICAL CHARACTERISTICS	NORN 7M	NORN 8M	NORN 9M	NORN 10M
Carbon fibre support frame (size, inches)	7	8	9	10
Maximum operational load (payload) (grams)	1500	2000	2500	3200
Maximum takeoff weight of the UAV (drone + battery + warhead) (grams)	3000	3500	4000	5500
Deployment time (minutes)	Up to 10	Up to 10	Up to 10	Up to 10
Type of power plant	Electrical	Electrical	Electrical	Electrical
Practical highest point of the UAV (meters)	500	500	500	500
Flight range with ground station (km)	15	15	15	15
Flight speed (cruising/maximum, km/h)	65/110	65/110	65/110	65/110
Maximum flight time (min.)	Up to 20	Up to 20	Up to 20	Up to 20
Wind resistance (m/s)	16	16	16	16
Operating temperature (degrees Celsius)	-8/+45	-8/+45	-8/+45	-8/+45
Motor operating temperatures (minimum/maximum, degrees Celsius)	25/99	25/99	25/99	25/99
Control frequencies (standard) (Mhz)	868-915	868-915	868-915	868-915
Control frequencies (offset, non-standard) (mHz)	720-750, 750-780	720-750, 750-780	720-750, 750-780	720-750, 750-780
Power supply (type, capacity)	Li-Ion 6s2p, 8400mAh	Li-Ion 6s2p, 8400mAh	Li-Ion 6s3p, 12600mAh	Li-Ion 6s3p, 12600mAh
Initiation system	included	included	included	included
Safety-lock system	included	included	included	included
Video frequencies	4.9-6.0 GHz	4.9-6.0 GHz	4.9-6.0 GHz	4.9-6.0 GHz
Number of safety-locks (pcs.)	3	3	3	3
Adjust video frequency on the fly	YES	YES	YES	YES



COMPLETE SET OF THE UAV (FOR ANY OF THE ABOVE MODELS)

NAME OF THE COMPONENT, UNIT OF MEASUREMENT	QUANTITY
Unmanned aerial vehicle UAV "NORN 7M (8M, 9M, 10M)", unit.	100
Accumulator batteries, unit	100
Manticore Munition Initiation Board (MIB)	100
RadioMaster Boxer Express LRS control panel, unit)	1
FPV Skyzone SKY04X V2 goggles, unit	1
ToolkitRC M6D battery charger, unit	5
Ground control station (repeater and radio control module), unit	1
Mast (height 9 m), unit	1
Transportation container for UAV and battery (box), unit	100
Transportation container for UAV components (case), unit	3
Spare parts, tools, accessories, set	1
Ties for fastening the warhead and battery, pcs.	600
Takeoff platform (stands for takeoff), unit.	10

NOTE: The Customer determines the complete set and the number of UAVs in its composition in the contract. There must be at least 100 UAVs in the UAV set.





The drones are supplied together with the **Manticore Munition Initiation Board (MIB)**, which is designed and manufactured by the Research and Development Department for the development of UAV onboard equipment of PJSC STC "Electronprylad" and serves to initiate the detonator's explosive reaction into the munition.

The MIB has two modes of operation: manual and automatic. The fuse system has a three-stage protection against uncontrolled detonation of the munition.

Namely:

1. **A physical switch for switching the system to the operating mode(Manual mode).**
2. **Safety check.**
3. **Delay of 2 minutes after pulling the check.**
4. **A software and hardware safety lock that operates on the operator's command via the remote control.**

Detonation occurs due to removing all safety locks and the physical contact of the locking elements with calculated flexibility and rigidity, making uncontrolled detonation or malfunction of the munition impossible or at the operator's command from the control panel.

There is also a self-deactivation function 20 minutes after the software safety lock is removed on the remote control. The MIB makes it possible to return the software safety lock, which in turn makes it possible to safely return the equipped drone, if necessary. Initiation by impact is realized with the help of contact antennae (two antennae can be connected).

There is a visual status indication for all modes:

- ◆ **A mount for munition with a diameter of 90 mm has been implemented.**
- ◆ **Vibration and shock resistance.**
- ◆ **Moisture protection.**
- ◆ **Temperature range is -30/+50° C.**
- ◆ **Protected housing.**
- ◆ **Full autonomy of operation.**
- ◆ **No piezo elements.**
- ◆ **Output voltage is 8V / 3A per detonator.**

PACKAGE SUPPLY: Manticore MIB, 2 pcs. contact antennae, a battery, the check, screws for attachment to the UAV, ties for munition attaching, plugs for transportation, transportation container.


MANTICORE

MAIN CHARACTERISTICS OF THE INITIATION BOARD FOR MANTICORE UNMANNED AERIAL VEHICLES

TECHNICAL CHARACTERISTICS	CHARACTERISTICS DECLAIED BY THE DEVELOPER
Overall characteristics (length, width, height), mm	L-130 W-70 H-33
Initiation board weight, grams	230
Mounting on UAV (type)	Included (bolted fastening)
Protective housing	Included (plastic)
Output voltage, V	8
Output current, mA	3000
Capacitance, mA	600
Status indication (visual indicator)	Included (light visual indication)
Mechanical board activation check	Included (plastic check)
Initiation by timer, min	Included
Safety timer, min	2
Activation of the board in flight from the remote control	Included
Initiation by pressing a key on the control panel	Included
Initiation by impact (overload value, g)	Included (realized by a contact antennae)
Self-liquidation	Included
Self-liquidation time, min	22
Temperature range of operation	-30/+50
Moisture protection (protection standards)	Ip55
Vibration resistance	Included
Name of the compatible detonator	Included (EDR, electric match, etc.)
Name of the flight controller compatible with the initiation board	All available (with BetaFlights support)

NORN GCS





In addition to the above results, the Research and Development Department for the development of UAV onboard equipment has successfully developed and started testing a real-time **Ground Control Station (GCS)** that can visually display streams and video feeds coming from the drone's camera.

The technical characteristics of the GCS comply with all standards and include high-quality components

The **NORN GCS** is a universal control complex designed for FPV-type UAVs. It stands out for its versatility, enabling it to operate the vast majority of existing FPV drones. This complex is entirely modular, allowing for configuration adjustments depending on the user's needs and specific tasks.

The control station consists of three main parts, namely:

1. **Ground module**
2. **Antenna unit**
3. **Remote mounting system for the antenna unit**

Ground Module

The NORN GCS ground module has a compact and convenient form factor. Reduced size and weight without loss of functionality provide a great advantage over similar control systems from other manufacturers.

The ground control module itself is housed in a protected shockproof case and has the following characteristics:

- ◆ 15-inch screen with high resolution
- ◆ Possibility to duplicate the video signal to two additional outputs for parallel playback on other devices
- ◆ Separate output for the control signal
- ◆ Multiple charging outputs for charging additional devices, such as tablets or smartphones
- ◆ Availability of a digital video module for the possibility of broadcasting flight data in real-time
- ◆ Availability of a reduced ground station module that can fit in a pocket

The **NORN GCS** ground module consists of:

1. **Control module**
2. **RadioMaster Boxer remote control**
3. **SkyZone 04X glasses**

The **NORN GCS** antenna unit works with all popular frequencies used in modern FPV UAVs.

Namely:

1. **Video transmission at frequencies of 4.9-6 GHz**
2. **Video transmission at frequencies of 1.1 - 1.3 GHz**
3. **Control signal transmission in the range of 720-1020 Mhz**

Antenna unit

The antenna unit contains the main video communication unit operating in the range of **4.9-6GHz** and a secondary element that can be quickly replaced with a similar one or one with extended functionality and changed frequencies. Each of the video elements is equipped with appropriate antennas. The VSWR of each antenna is, on average, no more than 1.2 and is maintained over the entire range of supported frequencies. This allows for efficient operation without losing quality and communication range, which is currently **30+ km**.


The main control module operates in the range of **720-1020 MHz** and is also quick-release, which allows the antenna module to be adapted to any conditions.

Operation of the antenna unit is as simple and intuitive as possible. The module contains physical switches that configure the operating modes. There is also an option to remotely control the station from the remote control. It allows you to switch the station on and off, change control and video frequencies without having to flip the switches on the antenna station physically.

NORN GCS is a truly modular and efficient system that allows you to adjust the control and video transmission frequencies depending on your requirements and needs.

For ease of use, the **NORN GCS** has a set of remote mounts that raise the antenna unit module to a height of up to 9 metres, eliminating most elevation differences and providing good long-distance communication.

For signal transmission from the antenna unit to the case, a 50-metre-long protected cable is used, which connects directly to the ground control module.



PURPOSE

The module for automatic targeting of an aerial weapon is intended for autonomous control of an aerial weapon (FPV drone, autonomous or barrage munition) after targeting by the operator to the target and transferring the functions of maintaining the direction to the target from the operator to the **MODULE**

The flight and navigation equipment of the **MODULE** ensures flight operations in simple and complex meteorological conditions at any time of the day or year. The operational limitations of the **MODULE** are determined by the operational limitations of the UAV. The **MODULE** provides automatic control and execution of all manoeuvres typical for unmanned and manned aircraft in climb, horizontal flight manoeuvring and descent modes.

OPPORTUNITIES

- ◆ Capturing and holding a course on moving and stationary objects from a distance of **up to 500 metres**
- ◆ Automatic (without the operator's participation) keeping the course on the target from the moment the module is initialized until the target is hit or the mission is cancelled by the operator
- ◆ Autopilot mode - the drone is able to pass through the EW impact zones in automatic mode
- ◆ The possibility of using day and night (thermal) vision with cameras

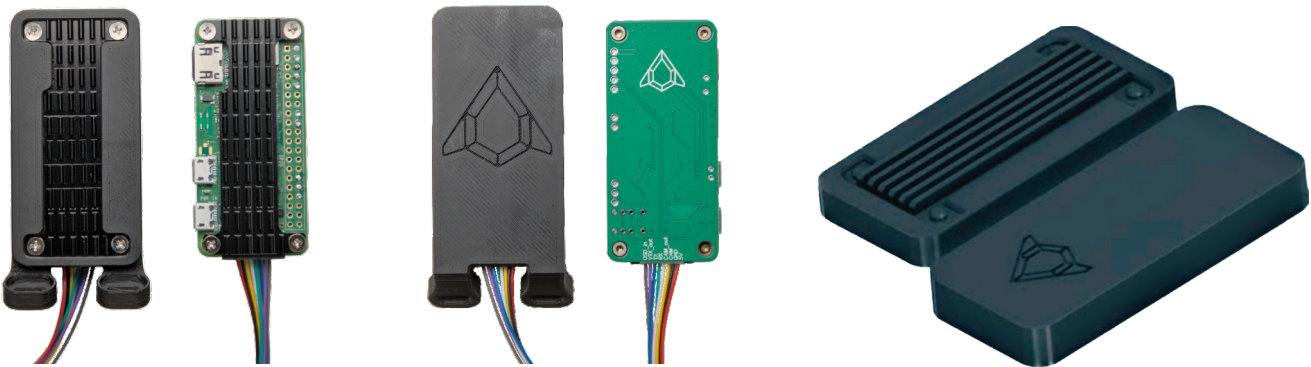
MODULE CONSTRUCTION

The **MODULE** is made in the form of a monoblock in a plastic, composite case.

The **MODULE** is connected to the UAV by a cable loop. The cable loop is supplied with the **MODULE**.

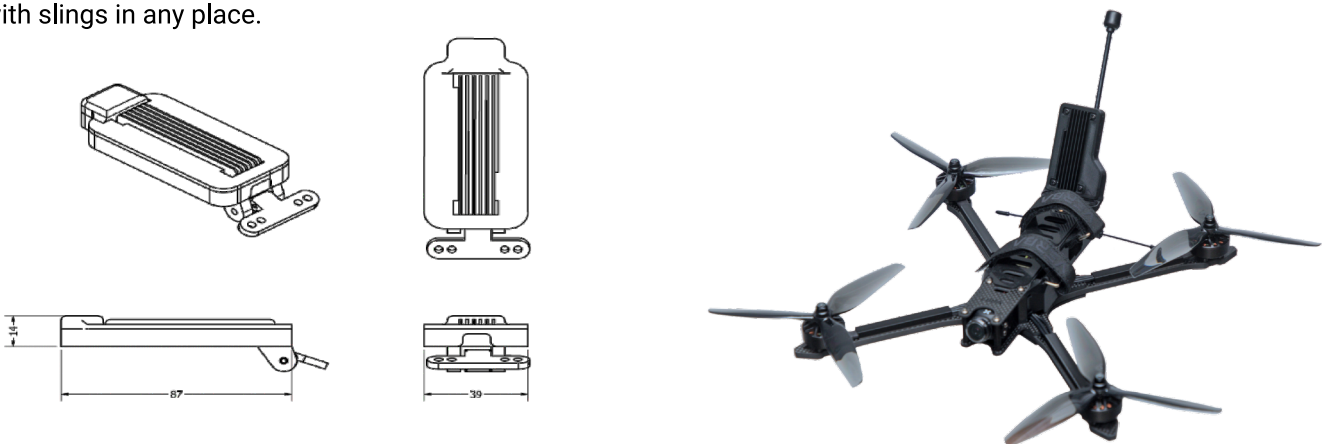
The installation of the cable loop is carried out by the Customer at the production site during the UAV assembly.

The connection of the **MODULE** to the cable loop is performed by switching through the "**MOSEL**" connector, which has 8 contacts.



INSTALLATION OF MODULES ON THE UAV

To install the module on a UAV, the design provides legs with holes through which the module body is screwed to the drone frame. This mounting option is compatible with most existing FPV drones. It is also possible to fasten it with slings in any place.





FUNCTIONAL SPECIFICATIONS	
Maximum speed, m/s, at which the MODULE provides the target holding mode:	
- on immovable objects	45
- on moving objects in catch-up mode	45
- on moving objects on meet-up mode	20
Angles of attack at which the MODULE provides the target holding mode:	
- minimum	15
- maximum	70
Switching time to the targeting mode, ms:	5
Switching time to attack mode, ms:	70
Delay time for activation of the target holding mode during MODULE operation, ms:	140
Maximum angle by which the scope can be adjusted:	20
Time to switch from attack mode to mission cancellation mode, ms:	40
Operating range at which aiming is possible with installed analogue cameras with a viewing angle of 120÷1600, m	
- minimum	500
- maximum	50
Software loading time, s	20
Flight controller control protocols used to operate the MODULE	CRSF
Average time for connecting the MODULE to the wired connector and installing it on the UAV body, min	5
ELECTRICAL SPECIFICATIONS	
DC input voltage, V	5
Input current, mA	200
Electrical connection type	cable loop, 8 contacts
PHYSICAL SPECIFICATIONS	
Dimensions (length, width, height), mm	97x39x14
Module weight, g	40
Mounting the module	with screws to the holes in the frame, or with slings in any place
Protective case	yes
OPERATIONAL SPECIFICATIONS	
Operating temperature range, °C	-30/+60°
Water resistance	yes
Packaging	yes
UAV COMPATIBILITY	
any with CVBS analogue cameras, CSI-2 digital cameras and CRSF control protocol	

12 FACTS

ABOUT PJSC STC "ELECTRONPRYLAD"

PJSC STC "Electronprylad" is a leader in Ukraine in the production of onboard equipment for aircraft. It aims to continue developing components and onboard equipment for UAVs, thus addressing the urgent issues of the country's defence capability, import substitution, and modernization of products for direct military requests and needs in real time.

- ◆ 60 years of successful activity in the field of development and production of aircraft components.
- ◆ More than 130 unique devices and developments for military and civil aviation!
- ◆ The company has a Certificate of Identification of the manufacturer (supplier) of products for the Armed Forces of Ukraine.
- ◆ Own design bureau.
- ◆ Own full-cycle production.
- ◆ Own control and testing laboratory, which allows carrying out a wide range of climatic-mechanical, atmospheric and electromagnetic tests in accordance with modern requirements for aircraft in accordance with DO-160G, both at the stage of product development and during serial production.
- ◆ Highly qualified labor collective of more than 300 specialists.
- ◆ Production capacity of 683,942 man-hours per year!
- ◆ The company has a quality system that ensures compliance with the requirements of DSTU ISO 9001.
- ◆ Development of international relations. The right to independently carry out export activities until 2025.
- ◆ Expansion of the enterprise's area of activity. As of today, the company is working on obtaining approval as a maintenance organization in accordance with Part-145 and Part-145B.
- ◆ Stable growth and development of the enterprise.

