

WAR AGAINST UKRAINE

Military drone with embedded CAN networks

The Ukrainian armed forces use Byraktar TB2 drones by Baykar Defense (Turkey) to defend against the Russian invasion. The embedded control units are CAN-connectable.



Byraktar TB-2 combat drones have destroyed Russian military equipment including tanks and trucks during the international law disgusting war; they can be equipped with up to four laser-controlled mini-bombs or missiles (Source: Baykar)

The combat drones manufactured in Turkey comprise multiple CAN-connectable control units. The control system features a triple-redundancy capability. The BUK-101 flight control computer (FCC) is the most crucial part of the UAV (unmanned aerial vehicle) platform, which offers a safe degree of autonomy combining robust estimation, navigation, and control capability. The FCC provides four CAN interfaces. Above all, critical avionic systems have to be continuously monitored and possible failures needs to be diagnosed and isolated immediately from the control cycle. The estimation software implemented on the FCC provides state information to the control cycles depending on modern algorithms based on stochastic sensor fusion. Navigation, control, and guidance algorithms are capable of fully autonomous takeoff, landing, taxiing, and waypoint navigation. The health-monitoring system detects emergency situations caused by subsystem malfunctions. The integrated autopilot function is also able to return the drone back home on a pre-defined route.

The auxiliary mission control computer with four CAN interfaces manages the non-critical data flow on the UAV. It transfers data that can be required by the flight-critical mission computer. Other CAN-connectable devices include the BDS-W-040 rotary actuator, the BLS-B-40 linear brake actuator, the BDS-208 dual-redundant servo actuator, and the BDS-008 rotary servo actuator. All these devices feature heterogenous communication redundancy (CAN and EIA-485). Also, the BDS-G-040 and the BLS-L-040 landing gears come with redundant communication interfaces (CAN and EIA 485).

In the beginning, the electronic control devices were partly purchased from US and Canadian (e.g. Wescam) suppliers. According to reports in the ZDF German TV channel, the Argos-II-HDT target acquisition system is supplied by Hensoldt (Germany). It does not provide a CAN interface. TDW an MBDA company located in Germany was blamed in social media to supply rocket components for the TB2 combat drone. The company stated that it has not delivered any technologies, parts or components to Turkey since 2019. Furthermore, there has never been a relationship for a delivery or supply for the Bayraktar TB2 drone or its armament. Baykar claims to have replaced entirely the foreign devices with Turkish products. But the micro-controllers and CAN transceivers applied in control units, actuators, and sensors might be still supplied by Western European, U.S., and Japanese chipmakers.

The Turkish combat drones have been proven themselves to be a persistent and significant weapon. The Turkish military operated them against the Kurdistan Works's Party (PKK) and the People's Protection Units (YPG) militant positions. They were also used by the Azerbaijan military in the Nagorno-Karabakh war against Armenia in 2020 and during the Libyan civil war since 2019.

The Ukrainian government published photos of TB2 drone attacks on Russian invaders on social media. The combat drones can stay in the air for 24 hours and climb 8 km with a take-off weight of 650 kg. It is reported that Ukraine purchased six TB2 drones in 2019 and ordered additional 24 ones in 2021. The Russian government reported the shooting down of at least seven of them. This information has not been confirmed by independent and neutral sources. As far as it is known, the Ukrainian TB2s are not controlled by satellite, which reduces their range in armed combat to around 100 km. They are operated from ground control stations.



The Byraktar TB2 drone is operated by human beings in the Ground Control Station System (Source: Baykar)

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