

Otonom Teknoloji – LTA vehicles

Peter Lobner, 19 June 2023

1. Introduction

Otonom Teknoloji is a privately owned Turkish defense technology company founded in 2012 in Ankara, Turkey, with operations and research and development starting in 2013. The firm’s mission statement is to “design and produce autonomous systems technologies for a better world, and to gain specialization in the field.” The firm’s website is here: <https://www.otonomteknoloji.com/en/>

Their lighter-than-air (LTA) products are the Doruk family of tethered aerostats, the Dolunay family of small, spherical tethered aerostats and the small Tepegöz unmanned, hybrid solar-electric airship. A Doruk aerostat made its first flight in 2014, followed in 2015 by a Dolunay



aerostat and a Tepegöz airship. All of Otonom Teknoloji’s LTA products are scaleable. The Doruk and Dolunay families of aerostats are offered in three different size ranges, for tactical, operational and strategic missions. Otonom Teknoloji reports that its LTA systems can be configured for a wide range of missions, including ISR (intelligence, surveillance, reconnaissance), port security, critical facility protection, precision agriculture and communications relay.

In addition to its LTA products, the firm produces a multicopter tethered unmanned aerial vehicle (TETRON), an electronic control unit for unmanned systems (MINISTEER), and a ground control station for unmanned systems (OTONOM GCS).

In October 2021, Otonom Teknoloji reported that it had signed a deal with the Iraqi government for supplying aerostat and airship systems, with technology transfer and an option for future co-production in Iraq.

This article provides an overview of Otonom Teknoloji’s LTA products: the Doruk and Dolunay families of aerostats and the Tepegöz airship.

2. Doruk aerostat

Otonom Teknoloji's first product line was the Doruk family of small-to-medium size tethered aerostats, which are available in three size ranges, with gas envelopes ranging from about 100 m³ to 4,780 m³ (3,531 ft³ to 168,804 ft³), carrying payloads ranging from less than 80 kg to up to 500 kg (176 to 1,102 lb), and operating at altitudes of 150 to 1,500 m (492 to 4,921 ft). The first Doruk prototype aerostat was flight tested on 16 July 2014.



*Doruk prototype in flight above its mobile mooring station.
Source: Otonom Teknoloji (2014)*

Defense Turkey reported on a 2016 test flight: “Doruk-133B Aerostat System is capable of performing flights at 1,000 m above ground level, with payloads up to 50 kg. The flight, which took place at the Mediterranean Sea, was a 3-day uninterrupted mission where object detection and recognition from 40 km range at 3,000 feet altitude (AGL) was successfully demonstrated. During the flights, electro-optical sensors with night vision capability and an AIS (Automatic Identification System) base station have been used as payloads. The streamlined form of Doruk aerostats enables high wind stability and flights in harsh weather conditions.”

Doruk aerostat general characteristics

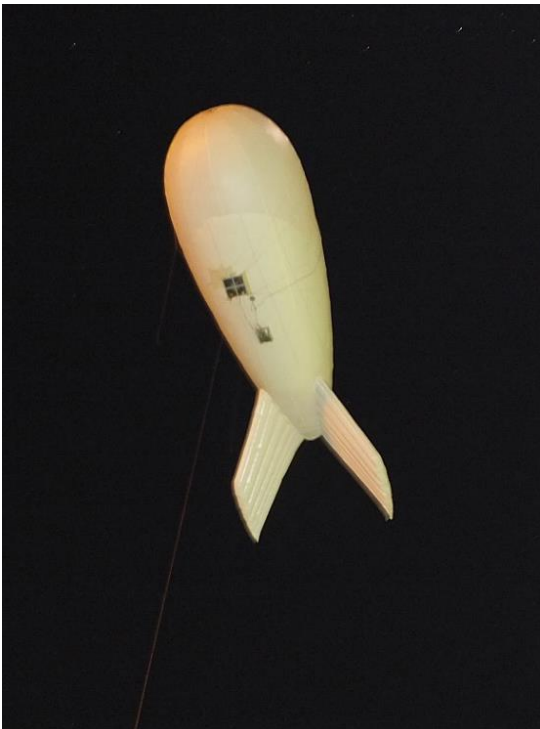
DORUK	TACTICAL	OPERATIONAL	STRATEGIC
Payload Capacity	<80kg	20kg-150kg	80kg-500kg
Operational Altitude	100 - 500 m (AGL)	300 - 1000 m (AGL)	500 - 1500 m (AGL)
Endurance	1 Week	1 - 2 Week	2 Week
Gondola	Modular Gondola Design	Modular Gondola Design	Modular Gondola Design
Operating Temperature Range	-20 °C/+55°C	-20 °C/+55°C	-20 °C/+55°C
Maximum Wind Speed	40 Knot	40 Knot	50 Knot
Pressurizing System	Automatic	Automatic	Automatic
Length	10-17,5 m	18-28 m	32-40 m
Max. Height (Parking Postion)	7,5-13 m	13-20,5 m	24-30 m
Max. Volume	100-460 m3	435-1700 m3	2450-4780 m3
Mooring Station	Mobile	Mobile	Fixed
Power Transmission	0 - 1,5 kW	1 - 5 kW	3 kW
Hauling Speed (meter/minute)	12-25	12-30	15-30
Lifting Gas	Helium	Helium	Helium

TACTICAL CLASS: An easy-to-use aerostat family, it is able to meet a broad range of tactical needs by being rapidly deployable in various fields of operation, and with a 24/7 mission capability.

OPERATIONAL CLASS: Is an aerostat system with 1,000 metre operational altitude, providing reconnaissance, surveillance and communication capabilities at long ranges. It is highly wind-resistant and stable.

STRATEGIC CLASS: Is the ideal solution for critical missions at long ranges and with long mission durations. This durable solution offers a high carrying capacity and operational altitude, allowing the use of different payloads simultaneously, and with a 24/7 mission capability

Source, Doruk table: Otonom Teknoloji



*Doruk 133B tactical aerostats.
Sources: (Left) Defence Turkey (2016),
(Above) Otonom Teknoloji*

Otonom Teknoloji reported that in 2015 a Doruk aerostat made its first flight from aboard a Turkish naval vessel.



*A Doruk 133B tactical aerostat above its mobile mooring station. Note the shadow of the ballonet inside the gas envelope. The small rectangular platform suspended from the envelope supports the payload module.
Source: Otonom Teknoloji*



*A Doruk operational aerostat on its mobile mooring station.
Source: Defence News (2021)*

The operational-size Doruk 173B made its first flight test in January 2020. At that time, it was the largest LTA vehicle ever flown in Turkey. During these tests, it carried payloads up to 78 kg (172 lb).



Doruk 173B operational aerostat in flight. Source: Otonom Teknoloji



Doruk 173B operational aerostat in flight. Note the black silhouette of a multi-copter drone in front of the gas envelope. Source: Otonom Teknoloji

3. Dolunay spherical aerostat

Dolunay is a family of small, spherical aerostats that are available in three sizes, with gas envelopes ranging from about 20 m³ to 120 m³ (706 ft³ to 4,238 ft³), carrying payloads ranging from 5 to 20 kg (11 to 44 lb), and operating at altitudes of 150 to 500 m (492 to 1,640 ft). A Dolunay aerostat made its first flight in May 2015. Otonom's integrated platform control system allows multiple Dolunay platforms to be managed from a single ground control station.



Dolunay spherical aerostat general characteristics

DOLUNAY	MINI	TACTICAL	OPERATIONAL
Payload Capacity	5kg	5kg-10kg	10kg-20kg
Operational Altitude	150m (AGL)	300m (AGL)	500m (AGL)
Endurance	1 Day	3 Day	1 Week
Gondola	Modular Gondola Design	Modular Gondola Design	Modular Gondola Design
Operating Temperature Range	-20 °C/+55°C	-20 °C/+55°C	-20 °C/+55°C
Maximum Wind Speed	20 Knot	20 Knot	20 Knot
Pressurizing System	None	Optional	Automatic/td>
Length	< 3 m	4,4-5,7 m	5,7-6,8 m
Max. Height (Parking Postion)	3,5-4,2 m	4,2-5,6 m	5,6-6,7 m
Max. Volume	< 20 m3	35-70 m3	70-120 m3
Mooring Station	Mobile	Mobile	Mobile
Power Transmission	0 - 1 kW	0 - 1,5 kW	0 - 3 kW
Hauling Speed (meter/minute)	12-20	12-20	15-30
Lifting Gas	Helium	Helium	Helium

MINI: This is an agile aerostat system that can be mounted on a mobile platform and operated by a small crew. The system can be mounted on both land and naval platforms thanks to its fuselage design.

TACTICAL CLASS: This easy-to-use aerostat family can meet a broad range of tactical needs, by being rapidly deployable in various fields of operation, and with a 24/7 mission capability.

OPERATIONAL: The aerostat system has a 500-metre operational altitude, providing reconnaissance, surveillance and communication capabilities at long ranges. The system is capable of carrying out week-long uninterrupted missions.

Source, Dolunay photo and table: Otonom Teknoloji

The Dolunay aerostat can be configured with a custom gondola for a wide range of applications, including, land traffic management, disaster and emergency management, ISR, communications relay, environmental protection and as a target balloon. Dolunay can be operated from a mobile launch platform or it can be secured to the ground with a Mobile Anchoring Station.



Dolunay aerostat on its mobile launcher. Black gas envelope provides a larger infrared signature for use as a target balloon. Source: Otonom Teknoloji

4. Tepegöz unmanned airship

Tepegöz is a small, free-flying, unmanned, autonomous, non-rigid airship designed carry to a 30 kg (66 lb) payload on missions lasting one week at an altitude of 3,000 meters (9,843 ft). It has a hybrid solar electric power system that supplies all propulsion, airship system and mission system loads. The airship is propelled by four small, shrouded, electrically-driven propellers supported from a transverse beam cantilevered from the small gondola under the gas envelope. Total weight of a Tepegöz airship is 150 kg (330.7 lb).

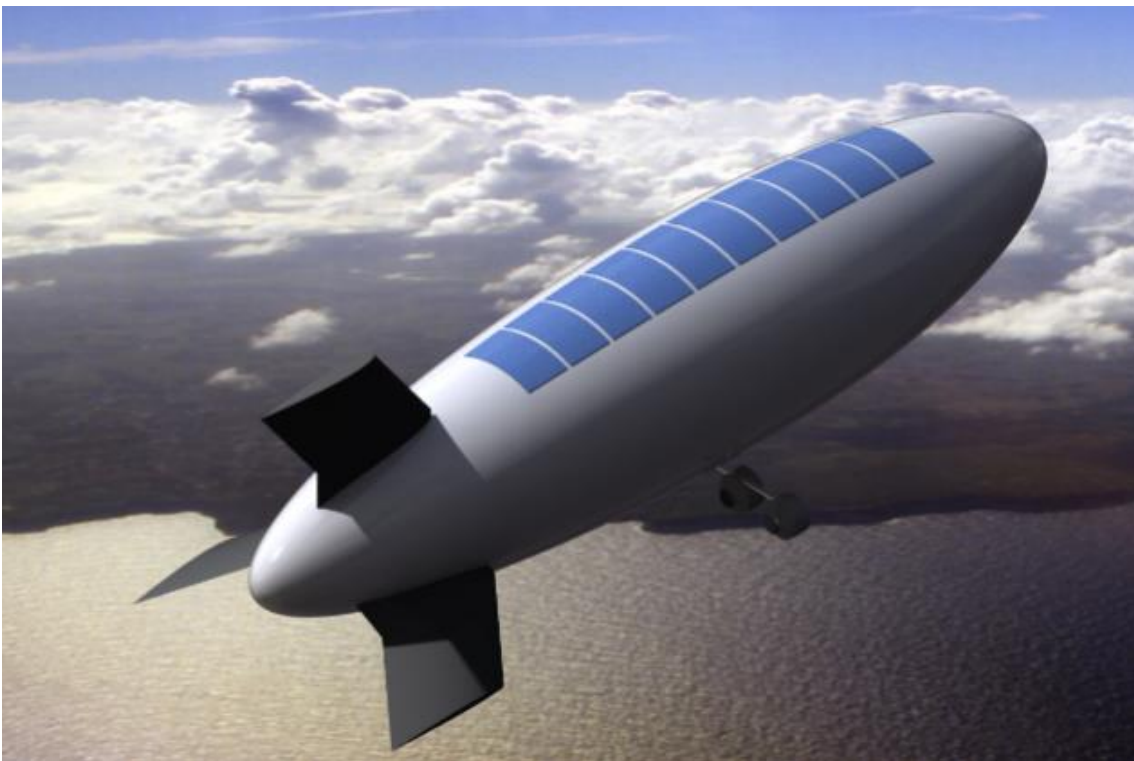


*Rendering of a Tepegöz unmanned, autonomous airship, stern quarter view.
Source: Otonom Teknoloji*

General characteristics of the Tepegöz airship

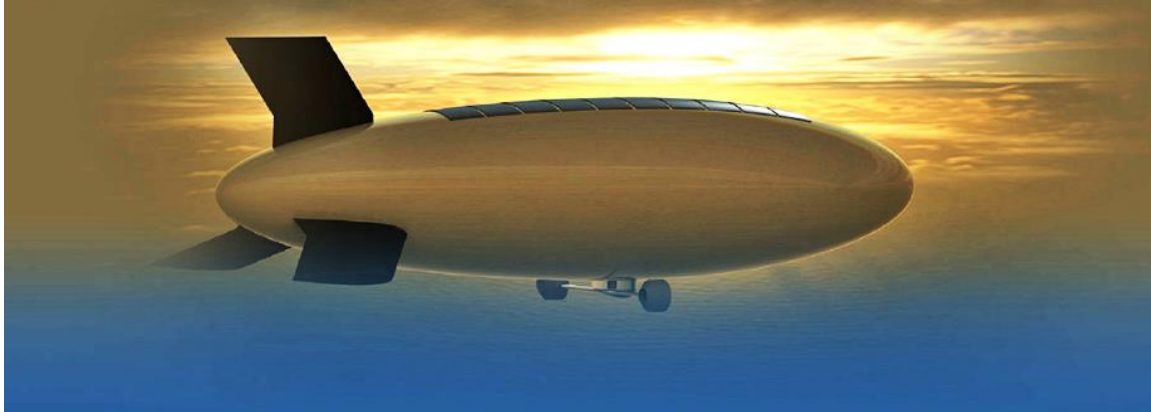
Parameter	Tepegöz
Length	10.4 m (34.1 ft)
Width, max	3.2 m (10.5 ft)
Height, overall	3.8 m (12.5 ft)
Weight, overall	150 kg (330.7 lb)
Weight, payload	30 kg (66 lb)
Speed, cruise	60 kph (37.0 mph)
Speed, max	75 kph (46.6 mph)
Altitude, operating	3,000 m (9,843 ft)
Range, max	750 km (466 miles)
Power source	Hybrid solar electric / battery system
Propulsion	4 x shrouded, electrically-driven propellers
Mission duration	1 week (168 hours)

Among its corporate milestones, Otonom Teknoloji indicates that a Tepegöz airship made its first flight in 2015. However, more information about that flight or subsequent flights is not available.



*Renderings of a Tepegöz unmanned, autonomous airship.
Source, both graphics: Otonom Teknoloji*

Like other Otonom Teknoloji LTA products, the Tepegöz airship is expected to be scalable to larger sizes to support a wide range of civilian or military missions. Applications are expected to include aerial photography, military ISR and emergency / disaster management.



*Rendering of a Tepegöz unmanned, autonomous airship.
Source: Otonom Teknoloji*

5. For more information

- “Otonom Teknoloji conducted the first flight of the Doruk Aerostat System,” Otonom Teknoloji press release, 16 July 2014: <https://www.otonomteknoloji.com/en/otonom-teknoloji-en/otonom-teknoloji-conducted-the-first-flight-of-doruk-aerostat-system/>
- “Otonom Teknoloji successfully performed first flights of its Dolunay Aerostat System,” Otonom Teknoloji press release, 4 May 2015: <https://www.otonomteknoloji.com/en/otonom-teknoloji-en/otonom-teknoloji-successfully-performed-first-flights-of-its-dolunay-aerostat-system/>
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- “Tepegöz Specifications,” AVIA.PRO, 20 September 2016: <https://avia-pro.net/blog/tepegoz-tehnicieskie-harakteristiki-foto>
- “Domestic unmanned aerostat system to join Turkey’s border security,” Otonom Teknoloji press release, 6 March 2019:

<https://www.otonomteknoloji.com/en/otonom-teknoloji-en/domestic-unmanned-aerostat-system-to-join-turkeys-border-security/>

- “More Otonom Teknoloji Products Set to Enter Into Service,” Otonom Teknoloji press release, 7 May 2019: <https://www.otonomteknoloji.com/en/otonom-teknoloji-en/more-otonom-teknoloji-products-set-to-enter-into-service/>
- “Turkey’s Largest Air Vehicle Has Successfully Completed First Flight Tests,” Otonom Teknoloji press release, 13 January 2020: <https://www.otonomteknoloji.com/en/uncategorized/turkeys-largest-air-vehicle-has-successfully-completed-first-flight-tests/>
- Burak Ege Bekdil, “Turkish producer to supply aerostat systems to Iraq,” Defense News, 19 October 2021: <https://www.defensenews.com/global/mideast-africa/2021/10/19/turkish-producer-to-supply-aerostat-systems-to-iraq/>

Video

- “Otonom Teknoloji Uzun Dayanımlı Hava Platform Çözümleri / Persistent Surveillance Solutions,” (2.10 min), posted by Otonom Teknoloji, 11 August 2020: <https://www.youtube.com/watch?v=H5SOdKY3dMQ&t=4s>

Other Modern Airships articles

- *Modern Airships - Part 1*: <https://lynceans.org/all-posts/modern-airships-part-1/>
- *Modern Airships - Part 2*: <https://lynceans.org/all-posts/modern-airships-part-2/>
- *Modern Airships - Part 3*: <https://lynceans.org/all-posts/modern-airships-part-3/>