

DKBA (ДКБА) – lenticular airships

Peter Lobner, updated 11 February 2022

1. Introduction

Public corporation Dolgoprudnenskoe Konstruktorskoe Bureau of Automation (DKBA, or ДКБА in Russian) also is known as JSC



Dolgoprudnenskoe Design Bureau of Automatics (DDBA), and the acronyms DKBA and DDBA seem to be used almost interchangeably.

DKBA was established as OKB-424 on 26 November 1956, under the leadership M.I. Gudkov and

Chief Designer P.P. Dementyev, in the city of Dolgoprudniy, just north of Moscow. It is the successor to the pre-WW-II Soviet state firm Dirigiblestroy Combine of the USSR, which operated from 1932 until it was closed in 1940. When DKBA was formed sixteen years later as OKB-424, it became the only state-owned company that was engaged in the design and manufacture of all types of lighter-than-air vehicles, including airships and free/moored balloons.

Since DKBA was formed, they developed designs for a variety of airships, including several conventional airships and unconventional lenticular airships. Sergei Bendin, writing for the Russian Aeronautical Society in 2002, reported that the Soviet Air Force placed an order with DKBA for a lenticular airship. As part of this project, a 15-meter (49.2-ft) diameter lens-shaped prototype airship was built in 1968 and tested before the project was terminated. In the early 1980s, DKBA supported the Soviet Navy's interests in airships for patrol, anti-mine warfare and other applications. Due to funding issues that began during the perestroika reforms of the 1980s, the airship projects for the Soviet Navy were terminated.

After the collapse of the Soviet Union in 1991, DKBA became a Russian Federal State Unitary Enterprise (FSUE). Their website is here: <https://www.dkba.ru/who-we-are>

In 2002, Sergei Bendin reported on the then-current status of DKBA airship development and noted that designs for airships with carrying capacities of 20, 30, 55, 70 and 200 metric tons were being developed.

“A significant part of the work has been carried out on the project of the DP-70T lenticular airship, which is intended for the transportation of goods with year-round operation in all climatic zones. On the constructive basis of this airship, variants of an airship with carrying capacity of 200 to 400 (metric) tons have been worked out.

.....For greater competitiveness, FSUE DKBA is developing airship projects using standard aviation components and assemblies, including chassis, engines, avionics, which ensures high quality products with a significant reduction in production costs.”

The DP-70T was announced at the MAKS 2007 International Aviation and Space Salon, which was held near Moscow. However, due to the lack of an order for this lenticular cargo airship, the project was discontinued.

This article addresses DKBA’s work on the Aeropost project lenticular airships from about 2009 to 2013. DKBA’s work on conventional airships is covered in a separate article.

2. Aeropost project lenticular airships (circa 2009)

The initial goal of the Aeropost program was to develop an unmanned lenticular airship that was capable of round-the-clock observation of the Earth's surface. Subsequent variants were contemplated for a wide range of unmanned and manned applications such as border and coastal surveillance, pipeline and electric power transmission line inspection and security, scheduled cargo and passenger flights and military missions.

DKBA developed and flew two sub-scale lenticular demonstrator airships and developed

Small airship demonstrator

In 2009, DKBA built a small lenticular airship technology demonstrator, which had an envelope volume of 2.5 cubic meters (88.3 cubic feet) and a diameter of 2.4 meters (7.9 feet). This demonstrator was flight tested by remote control inside the DKBA “boathouse” at the Kirzhach airfield (Vladimir region) northeast of Moscow. This is the same airfield used by the Lokomoskai company to test a subscale model of their very different lenticular Lokomoskyner hybrid thermal airship.

DKBA’s demonstrator was designed to validate the basic flight characteristics and stability of their lenticular airship design. The small airship was reported to have demonstrated good controllability and maneuverability, especially at low speeds and during hover over a designated point.



*Demonstrator flying inside the DKBA boathouse.
Source: DKBA via LiveJournal (25Jan2009)*



*Demonstrator flying inside the DKBA boathouse.
Note the relatively small, black horizontal stabilizer.
Source, both photos: DKBA via LiveJournal (25Jan2009)*

Based on the 2009 sub-scale demonstrator indoor flight test results, DKBA began developing the designs for a larger demonstrator for outdoor flight testing and an even larger prototype airship.

The DP-27 “Anyuta” lenticular airship demonstrator (2011)

Following the sub-scale demonstrator indoor flight tests, DKBA built the larger 16-meter (52.5-foot) diameter remotely-controlled DP-27 “Anyuta” lenticular airship, which first flew outdoors on 22 September 2011 at the Kirzhach airfield.



DP-27 with gondola exterior skin removed inside its hangar.

Source: DKBA

The DP-27’s lenticular hull presents the same cross-section to the wind at all times and was expected to provide good stability in cross-wind and gusty conditions, ease of control, and high maneuverability. DKBA identified the following potential applications:

- Delivery of equipment to sites up to 40 km (25 miles) away.
- Real-time video monitoring and/or radio tracking for waterways, national frontiers, highways, places of interest, and sports / entertainment events
- Search and rescue operations
- Remote sensing:
 - Environmental, agricultural, and resource monitoring

- Monitoring the operating condition of hazardous facilities, such as refineries and oil / gas pipelines
- Monitoring and supervision of large construction projects
- Communications relay
- Illumination of objects on the ground at night
- Hydrographic, geographic and other research
- Promotional activities (airborne advertising)



DP-27 leaving its hangar. Source: DKBA

General characteristics of the DKBA DP-27

Parameter	DP-27
Envelope diameter	16 m (52.5 ft)
Envelope volume	520 m ³ (18,364 ft ³)
Lifting gas	Helium / stabilized hydrogen
Maximum useful load	100 kg (220 lb)
Propulsion	4 x 18.6 kW (25 hp) internal combustion engines, each driving a vectorable propeller
Speed, max	70 kph (43.5 mph)
Altitude, max	1,000 m (3,281 m) above mean sea level
Range (with 40 liters of fuel)	300 km (186 miles)
Payload power consumption	1 kW
Operating ambient temperature	-10°C to +30°C (+14°F to +86°F)



DP-27 tethered with gondola exterior skin removed.



DP-27 vectored propeller (1 of 4). Source, both photos: DKBA



DP-27 in free flight. Remote control station is in the foreground.



*DP-27 in free flight. Three of four vectored propellers are visible.
Source, both photos: DKBA*

DKBA displayed the DP-27 at the MAKS 2011 International Aviation and Space Salon, which was held from 16 to 21 August 2011 at the Zhukovsky airfield near Moscow.

In 2011, DKBA described their ambitious plans to build much larger lenticular airships with diameters ranging from 45 to 200 meters (147.6 to 656 feet) starting in 2013.

Basic design parameters for a planned production version were:

- Diameter: 200 m (656 ft)
- Maximum flight altitude (above msl): 5 km (3.1 miles)
- Propulsion: 8 x 400 hp (298 kW) propulsors
- Maximum speed: 90 to 100 kph (56 to 62 mph)
- Maximum flight range: 800 km (497 miles)

The Robotic Electrically-powered Platform (REP)



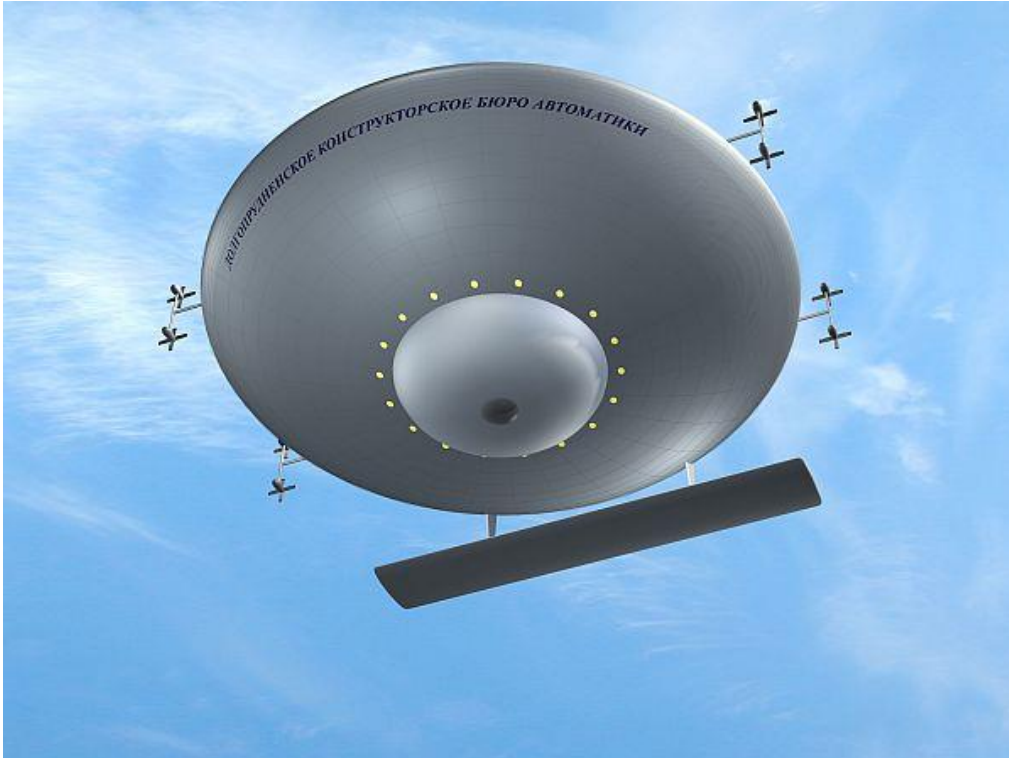
Based on the 2009 sub-scale demonstrator test results, DKBA began developing the design for a 45-meter (147.6-ft) diameter prototype known as an REP (роботизированной электродирижабельной платформы), and also referred to as the Aerocrat concept airship. DKBA projected that the first Aerocrat REP prototype could fly in the 2013 – 2014 time frame if the project received adequate and uninterrupted financing.



Rendering of an Aerocrat REP airship on the ground. Note the multiple landing legs. Source: DKBA via LiveJournal (25Jan2009)



Rendering of an Aerocrat REP airship in flight. Note the four sets of two electrically-driven propellers along the flanks of the airship. Source: DKBA via LiveJournal (25Jan2009)



Rendering of an unmanned Aerocrat REP airship. Note the large horizontal stabilizer at the stern; a common feature on lenticular airships. Source: DKBA via LiveJournal (25Jan2009)

General characteristics of the DKBA Aerocrat REP

Parameter	Aerocrat REP (Robotic electrically powered platform)
Envelope diameter	45 m (147.6 ft)
Length, overall	55 m (180.4 ft)
Height, overall	16 m (52.5 ft)
Envelope volume	13,500 m ³ (476,748 ft ³)
Lifting gas	Helium
Propulsion and control	Diesel generator supplying electric power to eight separate electric motor-driven propellers
Payload	3,000 kg (6,614 lb)
Speed, max	60 kph (37.3 mph)
Altitude, max	2,700 m (8,858 ft)
Range	2,700 km (1,678 miles)
Endurance	Up to 45 hours

A ballast-compensation system will make it possible to operate the airship without exchanging ballast during a load exchange and to stabilize the airship when it is parked on the ground.

3. Requiem for DKBA lenticular airships?

Apparently, the DP-27 had stability problems that were not resolved. I have been unable to find details on this matter.

Nonetheless, the 45-meter (147.6-ft) diameter Aerocrat REP prototype was not built, nor were any of the larger lenticular airship concepts.

DKBA's next airship project was the conventional, unmanned DP-29, which first flew in September 2014, and in 2020 was being developed as a modular family of conventional airships.

4. For more information

Concepts and demonstrator

- "Technologies of the New Century: Disc-shaped Dirigible, DKBA - © AEROCRAT concept," LiveJournal, 25 January 2009:
<https://aerocrat.livejournal.com/57504.html>

- Sergei Bendin, “Airship. Airships and airship building! The airship is controlled! Airship why is it needed,” Flamenco.ru, 21 November 2002: <https://flamenco.ru/en/dirizhabl-dirizhabli-i-dirizhablestroenie-dirizhabl---upravlyaemyi/>

DP-27

- “The star MAKS may become the DKBA lens-shaped airship project,” (in Russian), LiveJournal, 16 August 2011: <https://aerocrat.livejournal.com/135802.html>
- “Unmanned aircraft: terminology, classification, current status,” Section 1.2.2.5, “UAV of aerostatic type,” (this section contains a short description of the DP 27 unmanned airship in a longer Russian language article): <https://arsenal-info.ru/b/book/3398882726/12>
- “For Rosatom in 2015 to build an unmanned airship,” Encyclopedia of Safety, 18 October 2013: <https://survincity.com/2013/10/for-rosatom-in-2015-to-build-an-unmanned-airship-2/>
- “Airship DP-27 ‘ANUTA’,” RS TradeHouse, 2016: <https://www.rstradehouse.com/item?id=100210119861&l=en>

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/>
 - DKBA conventional airships (2DP, DP-6000 & DP-29 airships)
 - Myasishchev airship projects (2DP & derivative airships)
 - LocomoSky hybrid thermal airships
- *Modern Airships - Part 3*: <https://lynceans.org/all-posts/modern-airships-part-3/>