

Myasishchev Design Bureau - airships

Peter Lobner, 11 February 2022

1. Introduction

The Myasishchev Experimental Design Bureau (OKB-23) was founded in 1951 by Vladimir M. Myasishchev, with a goal of



developing a jet-powered strategic bomber for the Soviet Union. Their model M-4 Bison bomber was first displayed to the public in a fly-over of Red Square on May Day, 1 May 1954. The Bison was a surprise to the United States and its NATO allies. A more powerful model 3M, known in the West as the Bison-B, first flew in 1955.

The imposing Myasishchev M-50 supersonic strategic bomber prototype, known in the West as the Bounder, made its first flight in October 1959.

In response to Nikita Khrushchev's December 1960 speech favoring missile development over aircraft development, the Myasishchev Design Bureau was dissolved by the end of the year, at which time, V.M. Myasishchev was reassigned as Director of the Central Aerohydrodynamic Institute known as TsAGI (<http://www.tsagi.com>). Work on the Bounder was discontinued. However, the M-50 made a dramatic flyover of Red Square on Aviation Day in October 1961. Production of versions of the 3M Bison-B continued until 1963.

In 1967, V.M. Myasishchev left TsAGI and reestablished the Myasishchev Design Bureau. In the late 1980s - 2000s, Myasishchev developed several airship concepts that are discussed in this article.

Today the firm is known as OJSC Experimental Machine-Building Plant n.a. (named after) V.M. Myasishchev, which is part of Russia's giant aerospace conglomerate United Aircraft Corporation (UAC). The Myasishchev webpage on the UAC website is here:

[https://www.uacrussia.ru/en/corporation/company/ao-](https://www.uacrussia.ru/en/corporation/company/ao-eksperimentalnyy-mashinostroitelnyy-zavod-im-v-m-myasishcheva/)

[eksperimentalnyy-mashinostroitelnyy-zavod-im-v-m-myasishcheva/](https://www.uacrussia.ru/en/corporation/company/ao-eksperimentalnyy-mashinostroitelnyy-zavod-im-v-m-myasishcheva/)

2. 2DP (2ДП) multi-role blimp (circa 1989 - 2004)

In 1988, the USSR State Commission of the Council of Ministers assigned the Dolgoprudny Design Bureau of Automation (DKBA) the task of developing an experimental non-rigid airship, based on design information obtained on the successful Skyship 500 developed by the UK firm Airship Industries.



This project was known by two names, DP-800 and the more common designation 2DP (2ДП in Russian).

Skyship 500 flying in 1983. Source: Wikipedia

The original goal was to build a static test article and two flying prototypes, and test them by the end of 1994. DKBA selected the Myasishchev Design Bureau as the lead enterprise for the design, manufacture and testing of the 2DP airship, with this business arrangement being finalized in September 1989.

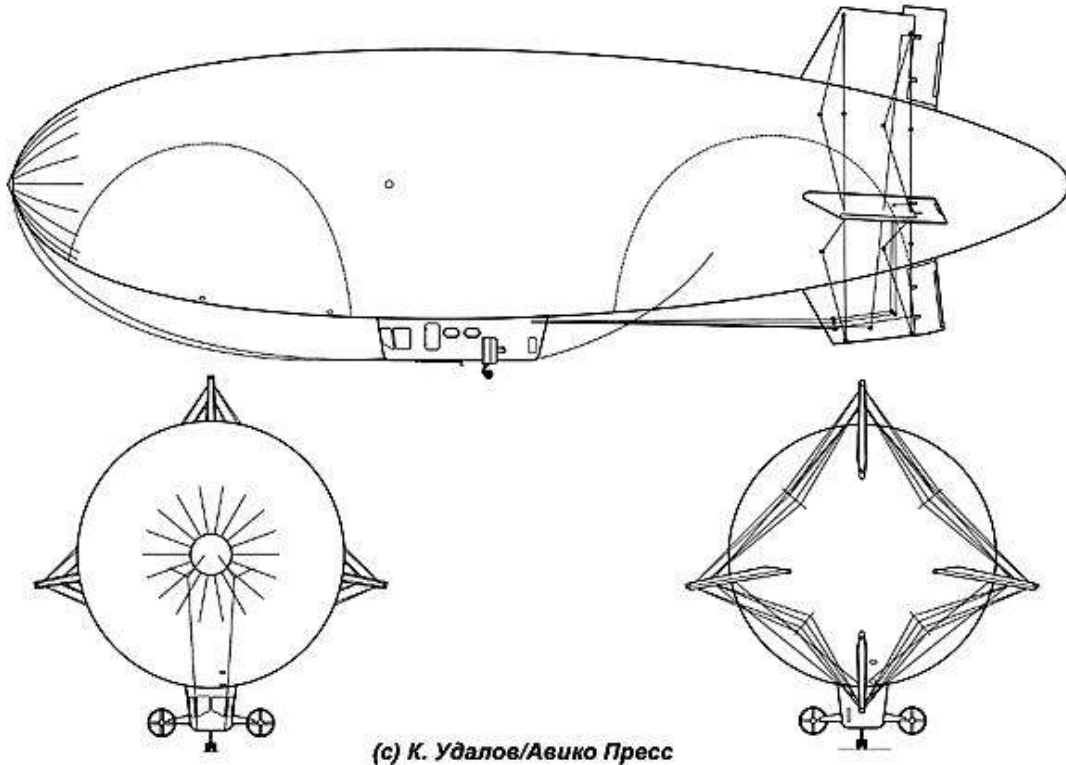
The project was complicated by the unavailability in the USSR of the Porsche engines used on the Skyship 500. In their place, larger, heavier Czech Walter M-601 turboprop engines were to be used. This required a significant redesign of the gondola, transmission, drive shafts, and outriggers that connected the ducted fan propulsors to the engines inside the gondola.

Development of the 2DP was delayed by weak economic conditions in the USSR in the late 1980s and after the Russian Federation was formed in December 1991. The project advanced to the point of engaging subcontractors to supply engines, structures and airship systems. However, the deteriorating economy in the USSR in the late 1980s and in Russia after the formation of the Russian Federation in December 1991 led to the termination of the project.

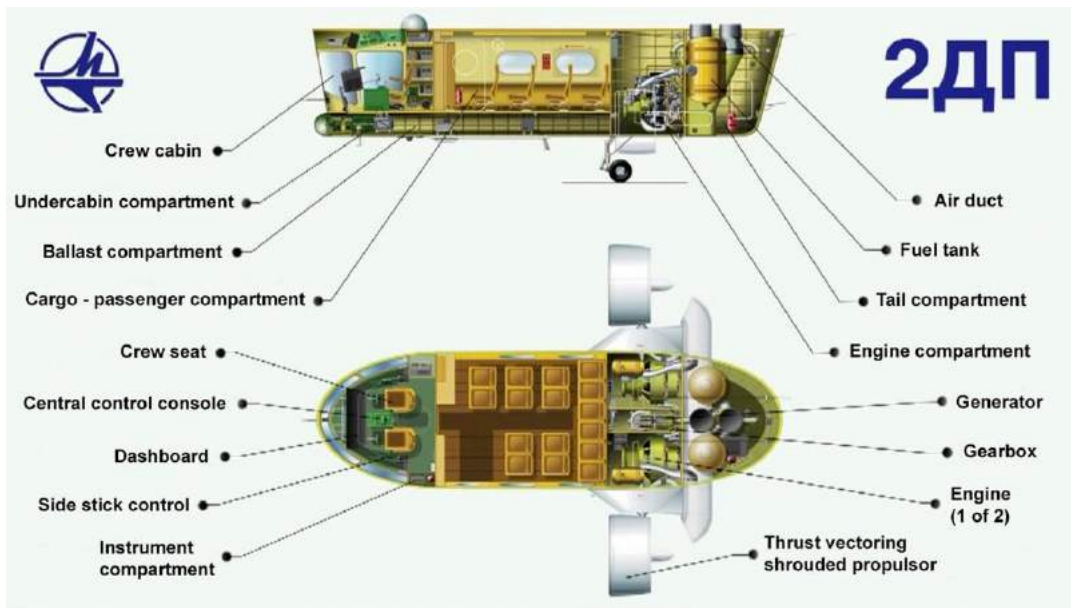
Comparison of the general characteristics of the 2DP (DP-800) and Airship Industries Skyship 500

Parameter	2DP (DP-800)	Skyship 500
Length	62 m (203.4 ft)	52 m (170.7 ft)
Diameter, max	15.75 m (51.7 ft)	14 m (45.9 ft)
Height, overall	22 m (72.2 ft)	18.7 m (61.2 ft)
Envelope volume	8,040 m ³ (283,930 ft ³)	5,153 m ³ (182,000 ft ³)
Envelope material	Domestic two-layer diagonally dubbed rubberized fabric on a with an aluminized coating	Polyester load carrier spray coated externally with titanium oxide impregnated polyurethane & sealed internally with polyurethane bonded Mylar gas retention film
Ballonet volume	26% gross volume: 2,092 m ³ (73,822 ft ³)	26% gross volume: 1,334 m ³ (47,110 ft ³)
Max gross lift	~8,000 kg (17,637 lb)	4,500 kg (9,990 lb)
Maximum takeoff weight	8,400 kg (18,519 lb)	4,430 kg (9,766 lb)
Empty weight	5,150 kg (11,354 lb)	3,185 kg (7,022 lb)
Payload	3,000 kg (6,616 lb)	2,000 kg (4,409 lb)
Propulsion	2 x Czech Walter M-601 turboprop engines rated @ 490 kW (666 shp) each, driving pylon-mounted, shrouded, 4-bladed, 1.5 m (4.9 ft) in diameter propellers, vectorable 120° up to 120° down	2 x normally aspirated 6-cylinder Porsche 930/01/A1/3 engines rated @ 152 kW (204 hp) each, installed in the gondola, driving pylon-mounted, shrouded, 5-bladed, Hoffmann reversible pitch propellers, 1.4 m (4.5 ft) in diameter, vectorable 90° up to 120° down
Gondola material	All metal semi-monocoque	Kevlar-reinforced plastic composite monocoque
Catenary cable material	Steel	Kevlar
Gondola dimensions	10.05 L x 2.95 W m (33.0 L x 9.7 W ft)	9.2 L x 2.4 W m (30.3 L x 7.9 W ft)
Accommodations	2 crew + 12 passengers	2 crew + 8 passengers
Speed, max	110 kph (68 mph)	93 kph (58 mph)
Speed, cruise		56 kph (35 mph)
Range	1,340 km (833 miles)	870 km (540 m) @ 74 kph (46 mph)
Ceiling, max	2,700 m (8,858 ft)	2,980 m (9,770 ft)
Endurance	44.7 hours	12 hours

The basic 2DP (2ДП)



General configuration of the 2DP (2ДП) non-rigid airship.
Source: K. G. Udalov / Avico Press via Secret Projects



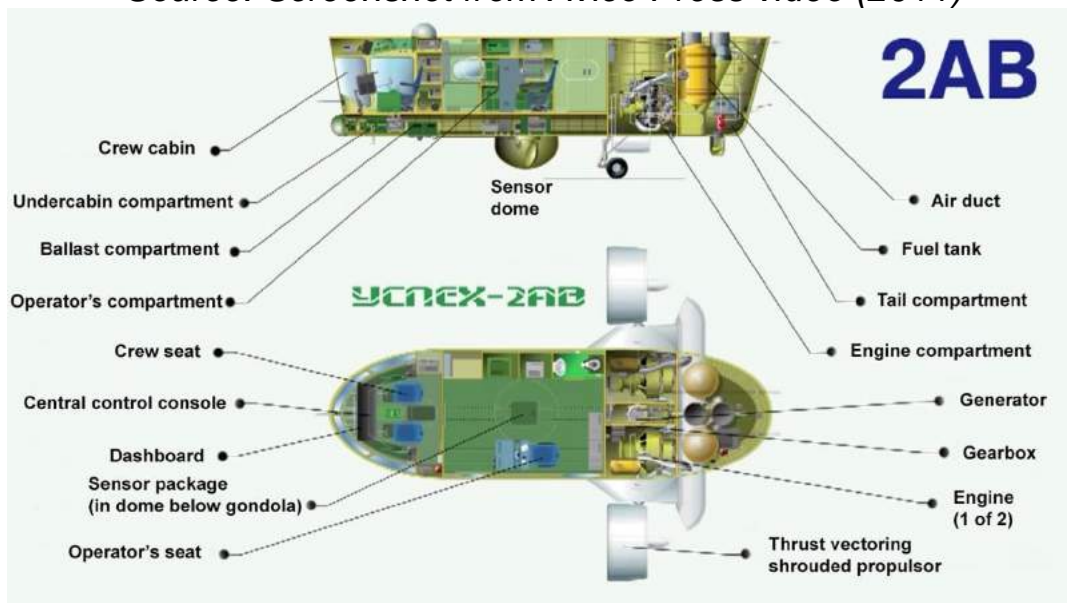
2DP (2ДП) gondola arrangement.
Source: Translation of screenshot from Avico Press video (2011)

The 2AV (2AB)

The 2AV was a variant of the 2DP that could be outfitted for a variety of surveillance and other missions. For example, electro-optical sensors can be installed in a steerable dome on the bottom of the gondola, or a large antenna array can be carried externally for geophysical studies.



*General configuration of the 2AV (2AB) non-rigid airship.
Source: Screenshot from Avico Press video (2011)*



*2AV (2AB) gondola arrangement
Source: Translation of screenshot from Avico Press video (2011)*



*2AV (2AB) with large external antenna for geophysical studies.
Source: Screenshot from Avico Press video (2011)*

The Cruise-1 passenger airship (КРУИЗ-1)

The hybrid, semi-rigid Cruise passenger airship concept was a 2DP variant targeted at the tourism market with expanded passenger seating in a larger gondola that offered panoramic scenic views. The Cruise-1 was announced by Myasishchev in a September 1994 press release at the Farnborough Air Show in the UK. The prominent feature of this airship was the two-level, large gondola with panoramic windows and seating for up to 28 passengers on the upper level and a small crew compartment and cabin entranceway on the lower level.

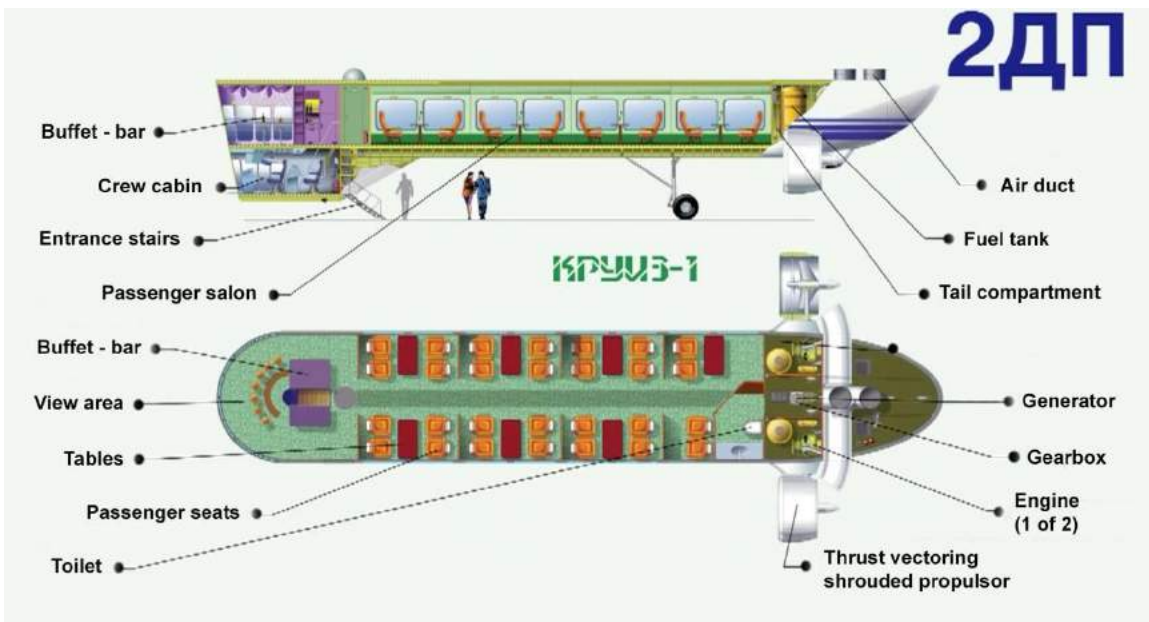
General characteristics of the Cruise-1 passenger airship

Parameters	Cruise-1 passenger airship (КРУИЗ-1)
Length	85 m (278.9 ft)
Diameter	20 m (65.6 ft)
Envelope	Non-rigid, multi-layer fabric envelope with an 8 year service life
Envelope volume	About 20,000 m ³ (706,293 ft ³)
Takeoff weight	14,000 kg (30,865 lb)
Speed, max	120 kph (74.6 mph)
Speed, cruise	110 kph (68.4 mph)
Propulsion	2 x TVD-100 gas turbine engines, each rated @ 716 kW (960 shp), installed in the engine compartment at the rear of the gondola and driving ducted fans via transmissions & drive shafts
Range	1,000 km (621 miles)
Operating altitude	1,000 – 2,000 m (3,281 – 6,562 ft)
Endurance	Up to 12 hours
Gondola dimensions	21.5 L x 5 W x 2.3 H m (70.5 L x 16.6 W x 7.5 H ft)
Accommodations	6 crew and 28 passengers
Landing zone	Any natural site 350 m (1,148 ft) in diameter

Myasishchev stated that development of this airship would take three to four years at a cost of about \$8,000,000 USD. None were built.



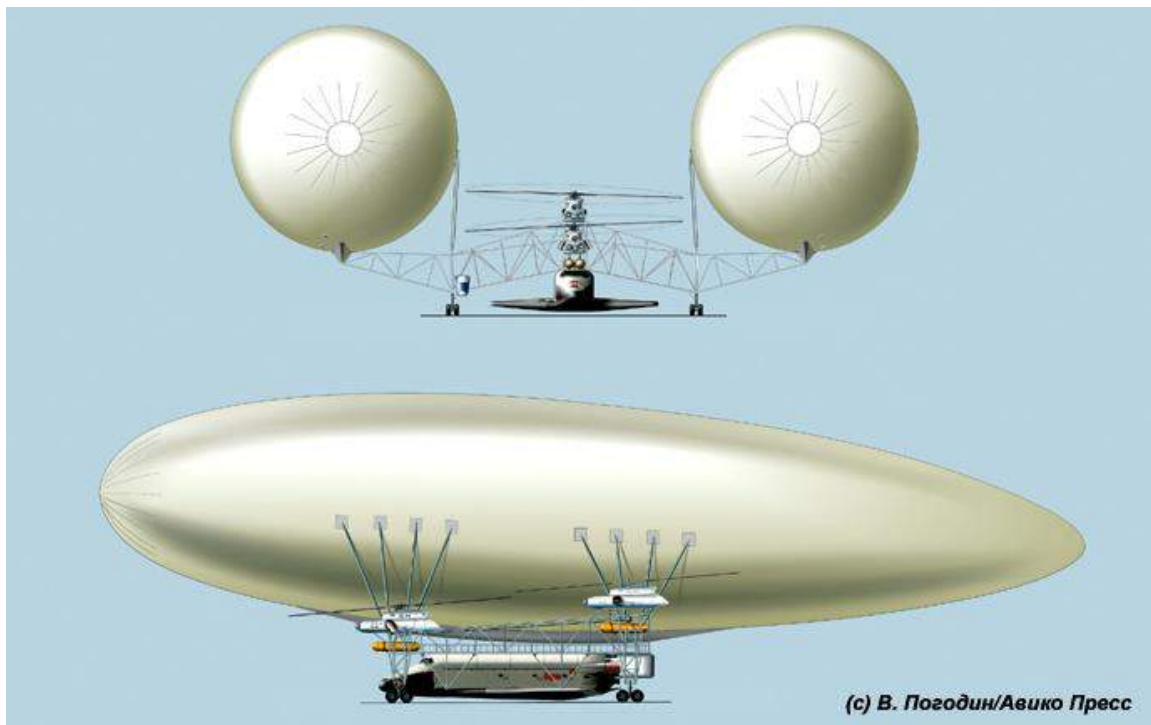
General configuration of the Cruise-1 airship (КРУИЗ-1) semi-rigid airship. Source: Screenshot from Avico Press video (2011)



Cruise-1 airship (КРУИЗ-1) gondola arrangement
Source: Translation of screenshot from Avico Press video (2011)

3. VS-80 Vertostat helicopter / airship hybrid

The VS-80 Vertostat was a heavy-lift, helistat-type, helicopter / airship hybrid vehicle. It was comprised of two large, non-rigid gas envelopes separated by an open, truss-type, structural framework that supported tandem, three-bladed helicopter rotor systems along the centerline of the vehicle, where the payload suspension points also were located. The general arrangement of the VS-80 is shown in the following diagram.



VS-80 general configuration. The bottom profile view is along the centerline (i.e., with one gas envelope removed)

Source: K. G. Udalov, Aircraft MDB, Book 2, via Secret Projects

Development of the VS-80 began in 1992. The design was the product of a consortium of several design bureaus and scientific institutions. Myasishchev served as the system integrator.

Like other helistat designs, aerostatic lift from the gas envelopes carry the weight of the empty vehicle, which would be trimmed for slight negative buoyancy (slightly heavier-than-air) for stability on the ground before the payload was attached. The weight of the payload is carried by the dynamic lift from the powerful tandem rotor system,

which also provided propulsion for forward flight, like a typical helicopter tandem rotor system.



(с) В. Погодин/Авиико Пресс

VS-80 central truss frame showing the placement of the tandem rotor systems, landing gear and the payload, in this case, the Soviet Buran space shuttle with its vertical tail fin removed.

Source: K. G. Udalov, Aircraft MDB, Book 2, via Secret Projects

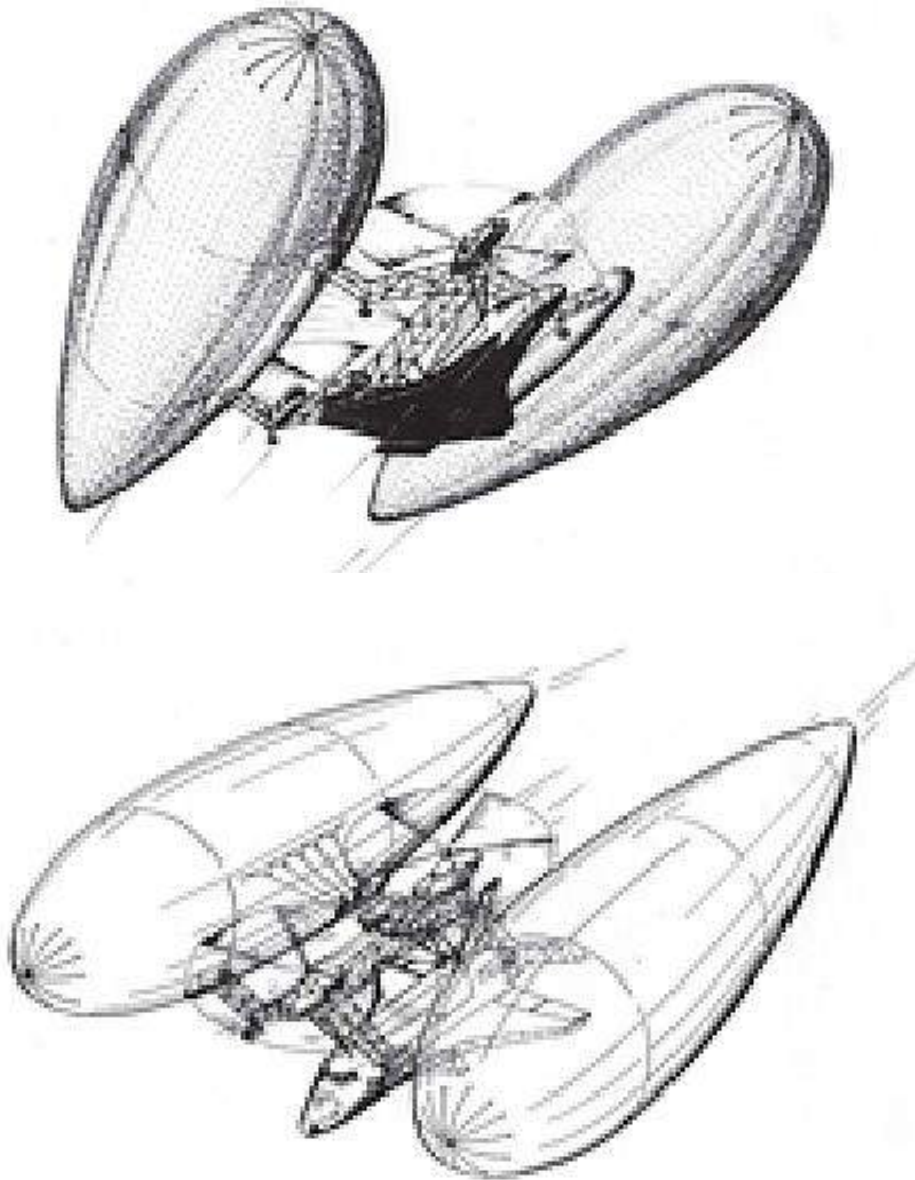
General characteristics of the VS-80

Parameter	VS-80 vertostat
Maximum gross weight	190 metric tons (209 tons)
Maximum payload weight	80 metric tons (88 tons)
Propulsion	Tandem rotor systems, with each rotor powered by two Lotarev D-136 turboshaft engines rated @ 7,755 kW (10,400 shp) each. Total vehicle propulsion power: 31,020 kW (41,600 shp).
Level flight speed	100 kph (62 mph)
Flight altitude	0 – 2,700 m (0 – 8,860 ft)

The VS-80 takes off and lands vertically and can hover with its load. On the ground, with the propulsion system shutdown, a load exchange can be accomplished without any exchange of ballast while

the payload is unloaded. The unloaded vehicle remains heavier-than-air.

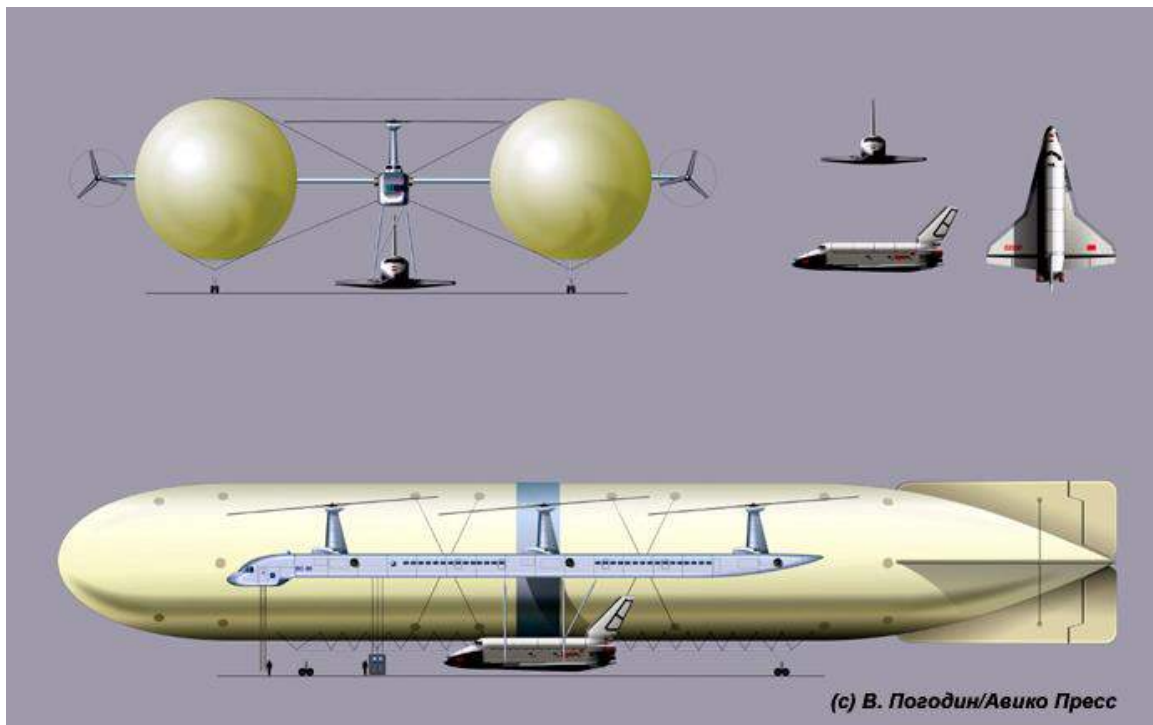
A model of the VS-80 was displayed in August 1992 at the MosAeroShow '92, which was held at Zhukovsky International Airport, about 40 km (25 miles) southeast of Moscow.



*Two views of a VS-80 in flight carrying a Buran space shuttle.
Source: K. G. Udalov, Aircraft MDB, Book 2, via Secret Projects*

4. VS-90 Vertostat helicopter / airship hybrid

The VS-90 Vertostat was an even larger helicopter / airship hybrid vehicle than the VS-80, in approximately the same general layout. Design studies of this giant helistat were conducted in 1989 and 1990 under the sponsorship research and production association NPO PANH. Their interest was in connection with a feasibility study for the introduction of helicopter / airship hybrid craft in the national economy.



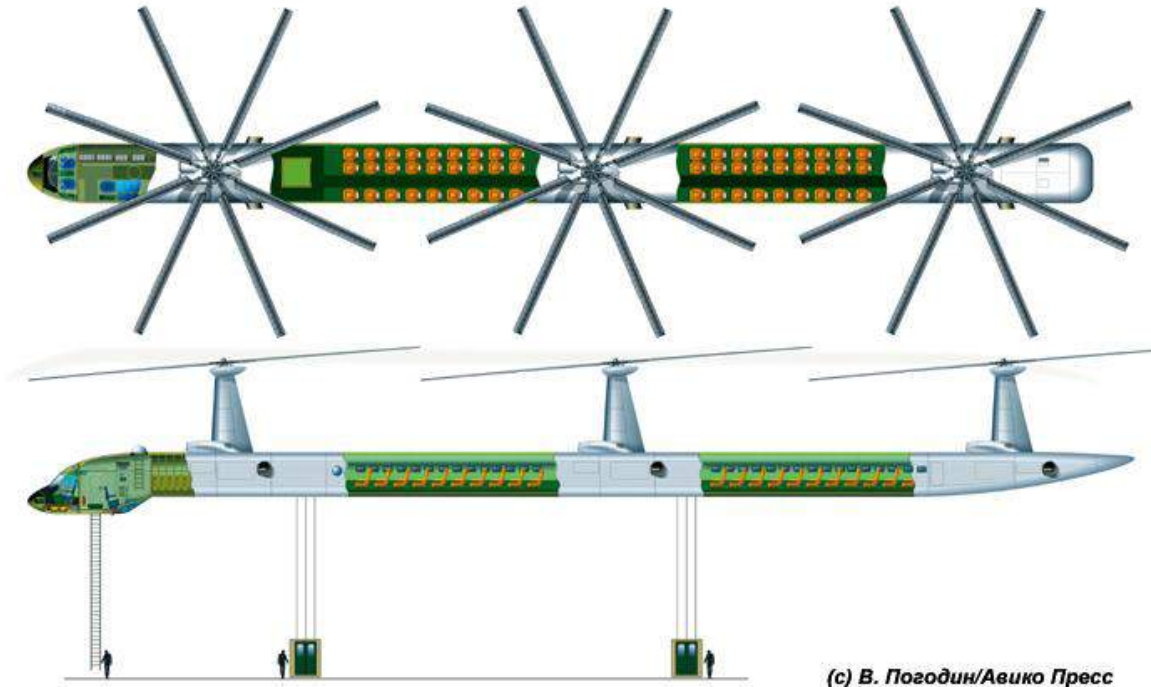
VS-90 general arrangement. The bottom profile view is along the centerline (i.e., with one gas envelope removed). Note that the suspended load is a Soviet Buran space shuttle with its vertical tail still attached.

Source: K. G. Udalov, Aircraft MDB, Book 2, via Secret Projects

The central fuselage of the VS-90 had two or three large tandem rotor systems (designs for both were developed). The cargo handling system was installed under the fuselage.

The fuselage was cantilevered on a single, central wing between the two large, semi-rigid gas envelopes, which also carried outboard propellers for vehicle propulsion and landing gear to support the

entire vehicle. Wire stays between the gas envelopes and between the envelopes and the fuselage maintained the lateral alignment of these giant components of the hybrid craft.



VS-90 central fuselage shown in a three tandem rotor configuration, showing passenger seating and access ladder and elevators.

The suspended payload attaches under this fuselage.

Source: K. G. Udalov, Aircraft MDB, Book 2, via Secret Projects

5. For more information

- K. G. Udalov, V. I. Pogodin, "Myasishchev Design Bureau – Aircraft MDB, Book 2," Avico Press, circa 2011
- Konstantin Udalov & Josef Gatyal, "Aircraft of V.M. Myasishcheva – Aircraft and Vertostats, Record Aircraft," Avico Press, 2019
- "Myasishchev airship projects," Secret Projects, posted by ucon, 30 July 2008:
<https://www.secretprojects.co.uk/threads/myasishchev-airship-projects.18512/>
- Yefim Gordon & Sergey Komissarov, "Unflown Wings – Soviet / Russian unrealized aircraft projects 1925 – 2010," pp. 344 –

345 (VS-80), ISBN 978-1-906537-34-0, Midland Publishing, 2013

Video

- YouTube video, “Multirole blimps” (10:30 minutes), Avico Press, likely circa 1994, posted 3 March 2011:
<http://www.youtube.com/watch?v=r4ttb6Dxtpl>

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