

Leningrad Volunteer Design Bureau of Dirigible Construction (OKB)

Peter Lobner, 11 February 2022

1. Introduction

In the early 1960s, several “Voluntary Design Bureaus” were formed in the Soviet Union to promote the development of dirigibles as a means for solving important national economic problems in cargo transportation, agriculture and research, and for filling an industrial void that had existed since before WW II. The first such bureau appears to have been the Leningrad Volunteer Design Bureau of Dirigible Construction, which was formed in 1961 under the leadership of V. B. Murychev. Others design bureaus were established during the early 1960s in Kiev, Novosibirsk and the Urals.

The Leningrad OKB was named after Konstantin Eduardovich Tsiolkovsky, who may be best known for his advances in rocketry, but also was a pioneer in aeronautical theory and airship design.



Model of an all-metal dirigible designed by Tsiolkovsky, on display at the Museum of the Yury Gagarin Order of the Red Banner and Order of Kutuzov Air Force Academy. Source: Runov/RIA Novosti

It appears that the OKB's first airship was the non-rigid Leningradsky Lesnicht (LL-1) designed in 1962 by V.B. Murychev and O. Antonov.

By 1964, the Leningrad OKB had carried out a "Feasibility study for the construction and use of airships in the national economy of the USSR" and developed a number of technical proposals for rigid airships. Among them were the following:

- The L-100 multipurpose single hull airship with a useful load of 100 metric tons (110 tons)
- The L-200 two-hull airship intended for agricultural work, with a useful load of 200 metric tons (220 tons)
- The L-300 three-hull heavy-lift airship with a useful load of 1,000 metric tons (1,100 tons)

A RAND Corporation report (1972) noted that, in a letter to the newspaper *Izvestiia* in March 1966, Leningrad OKB member R. Strong stated that the OKB had performed technical and economic investigations into the construction and application of dirigibles in agriculture, as transport in remote regions, in construction, in the laying of oil and gas pipelines and electrical lines, and for geological prospecting. The OKB called for the creation of special design, research, and production organizations for dirigible construction.

In a subsequent letter in May 1966, the OKB revealed that its designers were developing plans for thermal and semi-thermal dirigibles with provision for heating the helium to eliminate the need for ballast and to prevent ice formation. The OKB planned to incorporate these features in their design of the TsM-100 all-metal, ballastless airship, which would have a useful load of 100 metric tons (110 tons).

In 1971, the Leningrad OKB hosted the second All-Union conference on aeronautical aircraft.

The OKB's aeronautical interests also included a nuclear-propelled airship, mini-airships and hot air balloons.

The following sections provide information on the LL-1, L-100, -200, -300 and TsM-100 airship designs from several sources that each

provided only a limited view into the activities of the Leningrad OKB. The result is an incomplete story on these airship designs. It appears that only the LL-1 non-rigid airship built.

2. LL-1 Leningradsky Lesnicht

Jane's (1977) reported that the Leningradsky Lesnicht (LL-1) non-rigid airship was designed in 1962 by V.B. Murychev and O. Antonov for forestry work with a crew of five. The gas envelope for this modest airship had a length of 50.3 m (165 ft) and a diameter of 15.1 m (49.6 ft). With two engines, the airship had a maximum speed of 100 kph (62 mph). Jane's claims that this airship first flew in 1964.

3. L-100 single-hull

The L-100 was a rigid heavy lift airship with a useful load of 100 metric tons (110 tons). L-100 was not built.

4. L-200 twin-hull

The L-200 was a rigid twin-hull airship with a useful load of 200 metric tons (220 tons).

The RAND Corporation report (1972) stated:

“Almost a year passed (March 1964) before it was announced in *Izvestiia* that the Leningrad Voluntary Design Bureau had started planning a dirigible for use in agriculture. It was intended to be used for the transport of mineral fertilizers and in the control of agricultural pests and diseases. The announcement was made by N. A. Brusentsev, the deputy secretary of the Aeronautic Subcommittee of the Geographic Society of the USSR.”

In a 1975 NASA-sponsored study (NASA CR-137692), Goodyear Aerospace Corporation reported:

“Airship designers in Leningrad reportedly are working on plans for a double-hulled rigid airship under the supervision of an

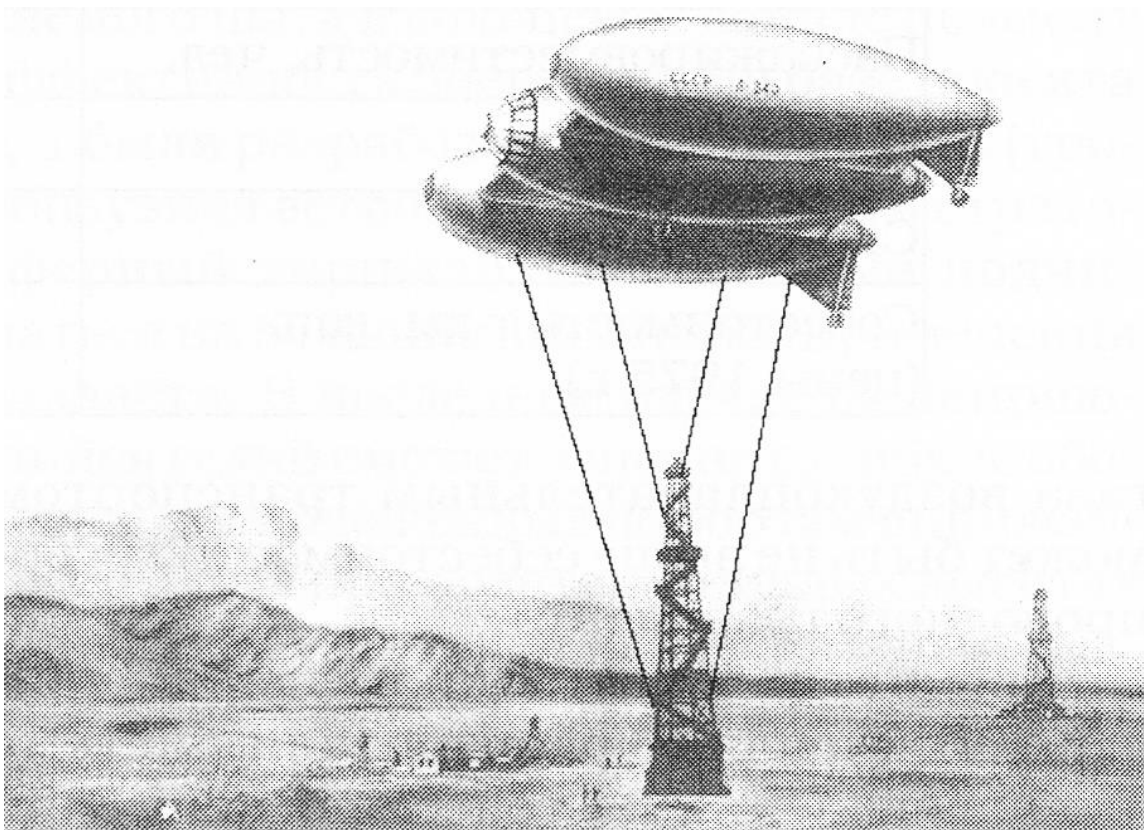
aeronautical commission sponsored by the Soviet Geological Society. Uses for such airships still being considered are:

- Transporting heavy loads over long distances in Siberia
- Transporting and installing heavy structures at building sites
- Radio communications
- Medium-range airbuses and tourist cruisers”

L-200 was not built.

5. L-300 triple-hull

The L-300 was a rigid heavy lift airship with a useful load of 1,000 metric tons (1,100 tons).



*Rendering of an L-300 transporting a heavy tower.
Source: Boyko (2001)*

L-300 was not built.

6. TsM-100

A 1983 UNIDO report described the genesis of the TsM-100:

“Airships have been studied for specific missions. Investigations were, for example, undertaken into the design of an airship for use in modular housing construction. The requirement was specified by the S. Lazo Polytechnical Institute in Kishinev and an airship was designed to meet the requirement by the K.E. Tsiolkovsky Dirigible Design Office in Leningrad.

The ship, designated the TsM-100, is an unballasted metal-clad craft 245 m long with a diameter of 37 m, making use of engine exhaust heat for aerostatic control. The gondola is 60 m long, 5 m wide and 5 m high and the craft would be capable of carrying a useful load of 100 tonnes at a cruising speed of 170 kph. The investigation concluded that such a vehicle would have great potential for modular housing construction, especially over distances of 50 km or more.”

The 1972 RAND report stated:

“In April 1970, it was announced in *Sotsialisticheskaia Industriia* [Socialist Industry] that the Leningrad Voluntary Construction Bureau had designed the first all-metal dirigible in the country, the TsM-100, which is to have a lift of 100 (metric) tons.

“In December 1970, *Komsomolskaia Pravda* printed an article repeating previous assertions by dirigible proponents about the economy, speed, and range of dirigibles. The TsM-100 model is described and is said to be a passenger air carrier that can be used as a crane as well.”

The TsM-100 made use of engine exhaust heat to manage the average temperature of its helium lift gas and thereby control aerostatic lift. Raising the temperature increased aerostatic lift, while cooling the helium decreased lift. This buoyancy control process was intended to reduce or eliminate the need for a ballast exchange in connection with payload loading and unloading and to compensate

for changes in airship weight during operation (i.e., from fuel use). The heated helium lift gas also was useful for preventing ice formation on the envelope during winter operation.

General characteristics of the TsM-100 airship

| Parameter | TsM-100 |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Type | Rigid, metal-clad |
| Length | 245 m (803.8 ft) (same as LZ-129 Hindenburg) |
| Diameter, max | 37 m (121.4 ft) |
| Fineness ratio (L/D) | 6.62 (more slender than LZ-129 Hindenburg @ 5.95) |
| Volume | About 160,000 m ³ (5,650,000 ft ³) (about 80% of the LZ-129 Hindenburg volume due to a more slender hull) |
| Gross lift | About 186,610 kg (409,200 lb) |
| Useful load | 100,000 kg (100 metric tons / 220,462 lb), including the weight of crew, passengers, fuel & oil, & cargo |
| Gondola dimensions | 60 m long x 5 m wide x 5 m high (197 x 16.4 x 16.4 ft) |
| Speed, max * | 170 to 201 kph (106 to 125 mph) |
| Range * | 16,093 to 20,921 km (10,000 to 13,000 miles) |

* Sources differed on the value of this parameter

V.B. Murychev directed the construction of a working model of the all-metal TsM-100 dirigible. Regarding this model, the 1977 RAND report stated:

“The aeronautics enthusiasts, together with the workers of the ‘Orgtekhstroi’ Trust of the Construction Ministry of the USSR, also built and experimented with a 12-meter (39.4-foot) working model of the dirigible. The model took almost a year to construct. Its frame is made of duralumin with strongly constructed strips of bamboo and light balsa covered with duralumin foil. More than 70 specialists of various types took part in the design and construction of the model. The experiment was considered successful, and the possibilities of the functioning of dirigibles in construction work were verified.”

The working model was unveiled in April 1970 in Leningrad.

The full-scale TsM-100 was not built.

7. For more information

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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/>