SUPER HYBRID AIRSHIPS

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The AIRSHIP-GP project

HYBRID AIRSHIPS

Currently, the long-held opinion of specialists is that cargo dirigibles have to be hybrids. Demonstrators have been built and flown, prototypes are being built, developmental craft have been tested. Various designs have been around for thirty years.

And look at the companies! DARPA, Lockheed Martin, Northrop Grumman, Boeing, NASA. Who can say that they lack experience? And look at all the investment! From Germany, Russia, the USA, Canada. Massive funds have been invested.

So where are all those mammoth cargo dirigibles that should be sweeping the sky? We have plenty of experience in building the flying giants, our level of knowledge is sufficient, the funds have been laid out, the effort made so far is obvious, and nobody denies the need for these airborne carriers…

Where are the cargo dirigibles? So far, there aren t any…

In Russia they blame the bureaucrats - they don t grasp the need and the benefit… In Canada they say that commercial production will begin any time now… Lockheed points the finger at DARPA, DARPA reasonably points out that the cold war is over; hybrid dirigibles show potential for military transport, but not commercial…

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The concept of cargo dirigibles is literally hovering in midair… But something is obviously missing… some element is lacking…

What element? What s missing? Reliability? Safety? Economic feasibility? Controllability?

Our attempts to come to grips with this problem led us to the idea of a new propulsor for dirigibles. Evaluating the potentiality for a new propulsor led us on to a project for a new dirigible that satisfies that potential.

The design capabilities of the new dirigible for controllability and wind stability allow for the successful application of a well established ballast control system. Hereafter, two complimentary types of dirigibles will be seen everywhere: ones with controlling ballast, more common and with a smaller cargo load, and ones with no ballast, less common but with greater cargo capacity.

So what do we get? A superhybrid dirigible.

Why Superhybrid, exactly? Here's why ...

SUPERHYBRID AIRSHIPS

Why Superhybrid ?

Because the new dirigible can do anything that hybrid dirigibles can. That is;

- It can take off and land with a load both vertically and from a runway *;
- It can fly in “heavier than air” mode;
  It can fly using aerodynamic lift on the hull and stub wing.

* Looking into the future, construction of the runway type is not expected, simply because there will be no need for it.

What s more, superhybrid dirigibles can do what hybrid dirigibles can t:

- They can take off and land vertically with a full load without using engine power and without strong air flow under the cargo bay;
- It can stay in the air almost indefinitely with a full load;
- Superhybrids can do all these things in any wind all the way up to gale force, including manoeuvring precisely and hovering in a stationary position right above the ground or ground structures.
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- (like hybrids) their cargo capacity can accommodate several 40 foot or 20 foot standard containers in their cargo hold;
- (like hybrids) their cargo capacity can accommodate one truck with a 40 foot container or
- two trucks with 20 foot containers each in their cargo hold; they can be loaded/unloaded under their own power;
- Handle precise load placement in the hold;
  All superhybrid dirigibles are reliable, all-weather, high-precision, stable flying cranes with no limits on periods of operation;
- Their unique level of controllability and wind stability permits a superhybrid dirigible to operate in coordination with one or more other dirigibles for transport of inseparable heavy loads with a weight several times greater than the capacity of one dirig

In addition to everything above, superhybrid dirigibles with ballast control can also:

- Load and unload self-propelled wheeled and tracked vehicles up to 25 tonnes in weight under their own power in field conditions;
- Load and unload watercraft with a displacement of up to 25 tonnes into and out of the water, with crew;
- Fight forest fire hot spots patrolling from a constant airborne position;
- Save people and fight fires on upper floors of high buildings;
  Perform reconnaissance and deliver vehicles and equipment to catastrophe epicentres in the initial hours;

And that s far from the whole list…

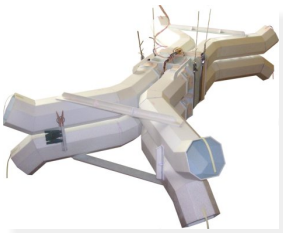
What makes all this possible?

THE NEW PROPULSOR

What is the new propulsor?

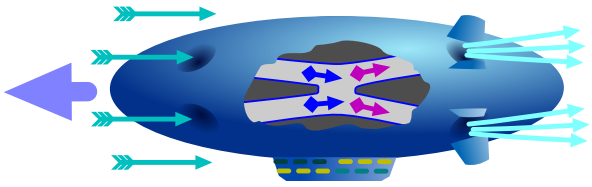
The new jet propulsion provides inertia-less any direction (in the full solid angle) thrust vector control and simultaneously any direction (in the full solid angle) the angular momentum vector control.

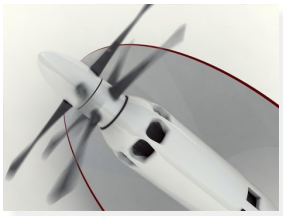
Propulsion is fully integrated into the rigid body airship. Propeller thrust is automatically adjusted continuously so as to fully offset the effect of wind loading.



The new propulsor ensures full wind insensibility at all stages of flight. Any direction crosswind up to 25 m/s is normally compensate while the airship is maneuvering or is unmoved hovering close to the land.

Normal straight flight (front control surfaces are composed of).





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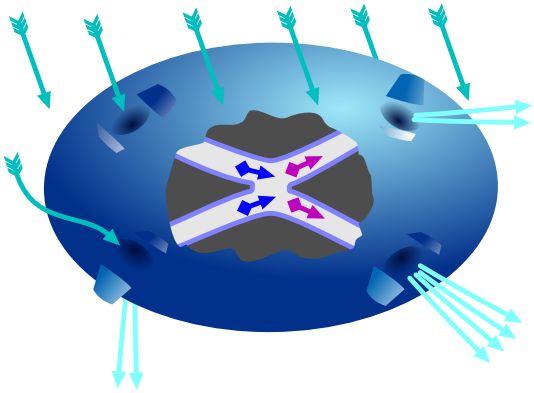
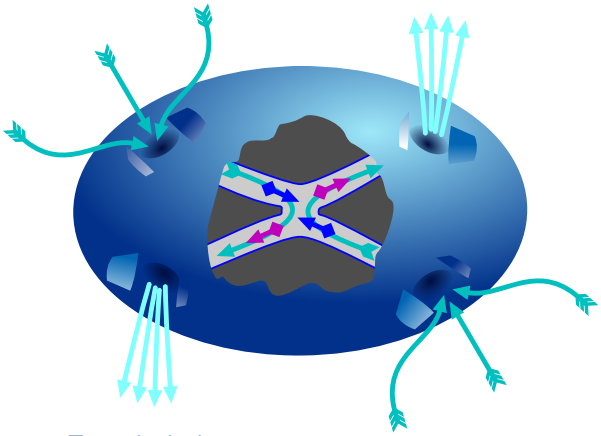
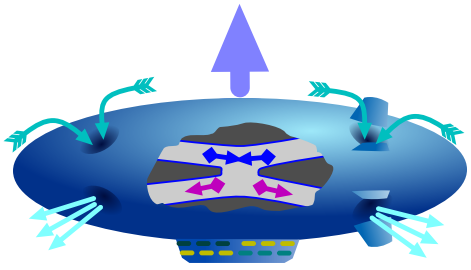


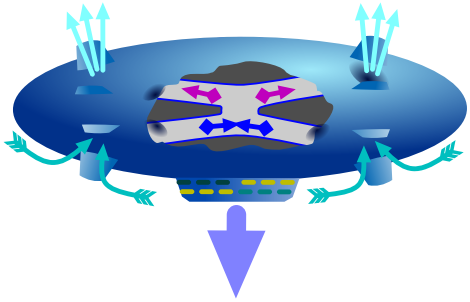
Resistance to lateral wind.



Turn clockwise.



Take off (no ballast control).



Landing (no ballast control).

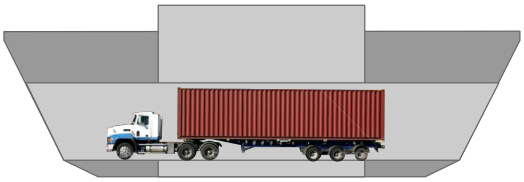
How to optimize an airship with a new engine? Let's see ...

THE SUPER HYBRID CARGO AIRSHIP

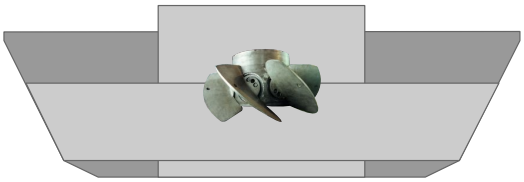
New Technology with New Capabilities

Loading / unloading of self-propelled vehicles to 25 tons (to 40 tons in emergency conditions).
Loading and unloading in field conditions.

26 x 5 x 4.5 m

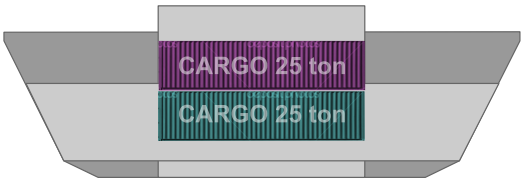


Loading / unloading to the cargo hold through the lower hatch up to 50 tons (unballasted).
Up to 65 tons in emergency conditions.
Loading can be carried out at a plant site.
Unloading in flying crane mode.
12 x 8 x 8 m



Containers can be transported with or without haulers.

Handles external transport of loads.



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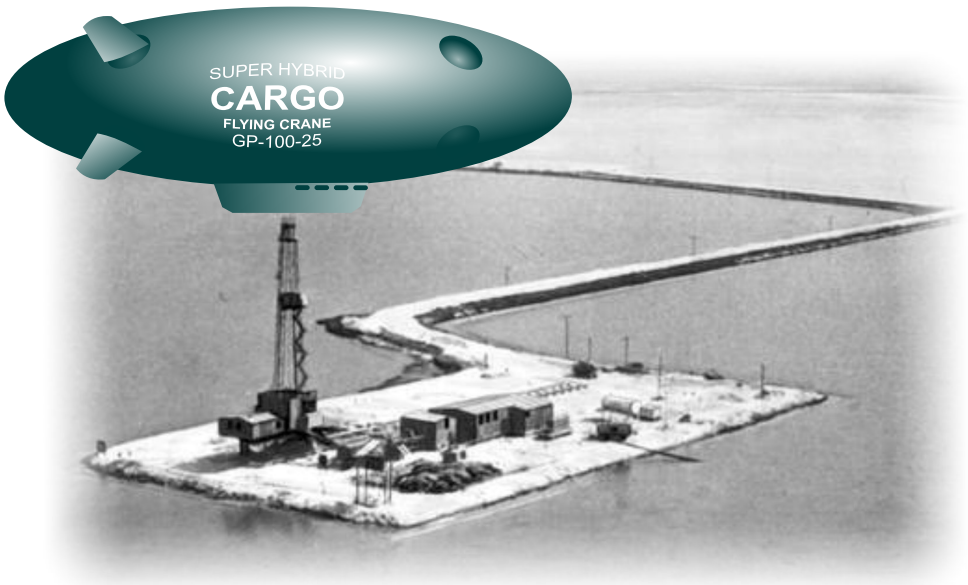
Accurate manoeuvrability and perfect stability in any weather are assured in flying crane mode. With balance control, weights up to 25 tons. With unballasting (water) weights up to 50 tons. That s when one dirigible is operating…and not two or three together.



More ...

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TECHNICAL CHARACTERISTICS

controllable ballast / unload ballast

Technical characteristics:

Size	**110 x 70 x 40 m**
Empty mass	**50 t**
Body volume	**160 000 m³**
Helium	**75 000 / 100 000 m³**
Ballast	**controllable / unload**
Engines	**4 x 2500 hp**
Fuel (normal)	**10 t (up to 35 / 60 t)**

Speed (range) ability:

Full speed	(4 x 2500 hp)	**120 km / h**	(480 km)
Normal speed	(2 x 2500 hp)	**85 km / h**	(640 km)
Middle speed	(1 x 2500 hp)	**60 km / h**	(960 km)
Low speed	(1250 hp)	**42 km / h**	(1280 km)

Positioning accuracy close to the ground – 0.2 m.

Limit of weather condition – up to a storm wind 25 m/s. Landing in fog, snow, rain with range of visibility 50 m.

Distance of deceleration in air (emergency shutdown) from maximum speed 30 m/s to zero – 200 m.

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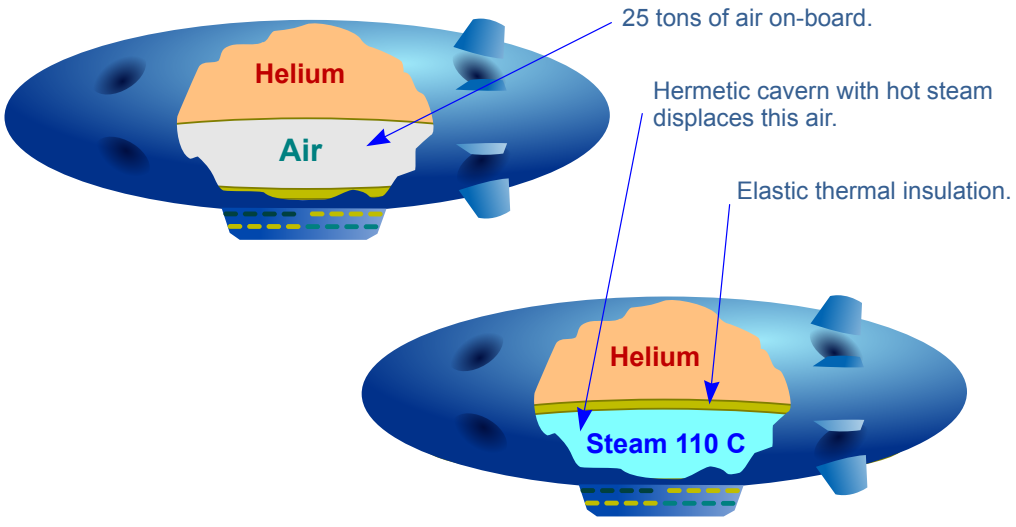
Altitude:

Hovering ceiling	(full cargo)	**0 - 2 000 m**	(unlimited time)
Dynamic ceiling		**up to 5 000 m**	



Compensation of fuel weight – by condensation of water from the exhaust gases.

TRANSPORTATION CHARACTERISTICS

controllable ballast / unload ballast

Load capacity – range:

Normal (fuel 10 t)	**25 / 50 tons**	120 km / h	**480 km**
Normal	**25 / 50 tons**	85 km / h	**640 km**
Normal	**25 / 50 tons**	60 km / h	**960 km**
Normal	**25 / 50 tons**	42 km / h	**1280 km**
Long range (fuel 20 t)	**15 / 40 tons**	120 km / h	**960 km**
Long range	**15 / 40 tons**	85 km / h	**1280 km**
Long range	**15 / 40 tons**	60 km / h	**1920 km**
Long range	**15 / 40 tons**	42 km / h	**2560 km**
Maximum range (fuel 35 / 60 t)	**0 / 0 tons**	120 km / h	**1600 / 2800 km**
Maximum range	**0 / 0 tons**	85 km / h	**2200 / 3800 km**
Maximum range	**0 / 0 tons**	60 km / h	**3200 / 5600 km**

Each cargo super hybrid airship has two cargo hold:

Size of main cargo hold is **12 x 8 x10 m**. Loading from the bottom.
Size of car hold is **4.5 x 5 x 26 m**. Horizontal (through) loading / unloading.

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Non-landing range of super hybrid airship with full cargo with refueling from ground car-tanker – unlimited.

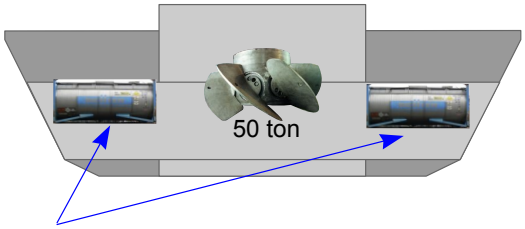
Specific fuel consumption:

Normal	25 / 50 tons	120 km / h	480 km	**0.8 / 0.4** kg / t * km
Normal	25 / 50 tons	85 km / h	640 km	**0.6 / 0.3**
Normal	25 / 50 tons	60 km / h	960 km	**0.4 / 0.2**
Long range	15 / 40 tons	120 km / h	960 km	1.4 / 0.5
Long range	15 / 40 tons	85 km / h	1280 km	1.0 / 0.4
Long range	15 / 40 tons	60 km / h	1920 km	0.7 / 0.3

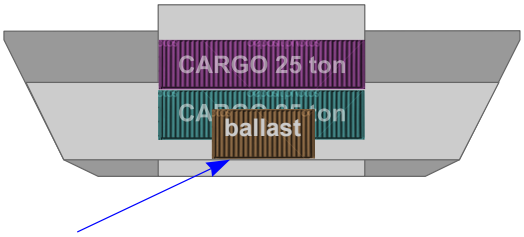
What new in load / unload? Let's see ...

Unloaded and controlled ballast work

Work with unloaded ballast



Two 20-foot emptied / filled in ballast water tank-containers (option).



Two 20-foot ballast loading / unloading containers (option).

Work with controllable ballast

Variant of super hybrid airship with controllable ballast does simply: lands, takes any cargo and takes off ...

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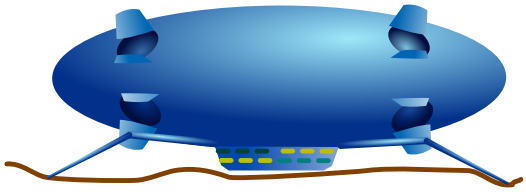
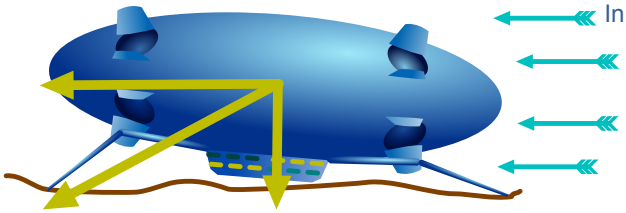
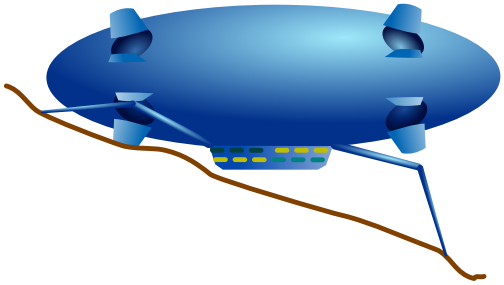


Variant of super hybrid airship landing gear.



In very strong storm weather condition super hybrid airship can do so ...



New features provide new ways of work ...

Other Ways to Operate

Cargo and passenger versions

- **Supply and provisioning airship** – the dirigible provides rotation for employees working in shifts and delivery of practically any load. Reliability, safety, dependability assured in all conditions, including polar night conditions.
- **Air shuttle (50 - 250 km or more range)** – all-weather, meaning regular flights, comfort – no pitching or rolling, low noise; courses can be set over water, ice, dry land or mountains together;

- **Air yachts** – super hybrid airship technology allows you to create a super-class yachts. Two floors, four super-cabins or ten cabins, low noise, no roll, anywhere landing or hovering – all of these are ideally for a king yacht.
- **Flying hotel** – this option is technically possible, but requires careful economic calculations...
- **Expedition airships** – ideally for any geography locations – from Poles to equator and from a desert to a sea – and any targets of expeditions... But some expensive.

Search and rescue – any superhybrid dirigible is ready for use in search and rescue without additional outfitting. But specialized rescue dirigibles can be made for use by EMERCOM forces. Specifically, flying evacuation hospitals. Superdirigibles can operate in reconnaissance mode at the epicentre of a catastrophe from the earliest hours, in any weather and at any time of day.

- **Flying hospital** – this option is special type off R&S airships for the target of work in the epicenter of any disaster and evacuation.

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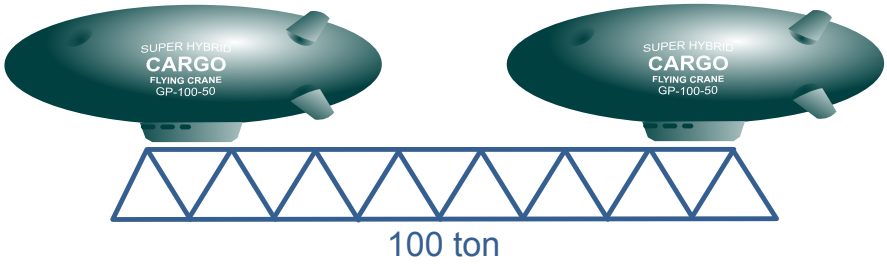
- **Unloading of ships without the dock** – only super hybrid airship can do this by air. Unloading of ships without the pier during the day and night, winter and summer, in a snowstorm and fog. 50 and 25 tons of payload. 5 - 500 km range.
- **Forest fire** – struggle against the primary forest fires, from the position of duty in the air. Unloading firemen with heavy equipments and after that their reception on board.
- **City fire** – only super hybrid airships can rescue the victims from the upper floors of tall buildings.
- **Passenger airships** – this option provides a high level of safety, comfort, low noise, all-weather (it means - regular flights), the minimum requirements for ground-based infrastructure. However, it is necessary to make additional economic calculations.

- The military transport potential for superhybrid dirigibles is obvious enough; so obvious, in fact, that we don t need to go into it here. However, it is interesting and important to note that the military could completely (or almost completely) assume all R&D issues. Including the financial ones.

There are more interesting variants of work ...

Team work of super hybrid airships

Two or more super hybrid airships can team. This method allows to deliver one-piece heavy cargo by air, using ships with capacity in times less than the weight of cargo.



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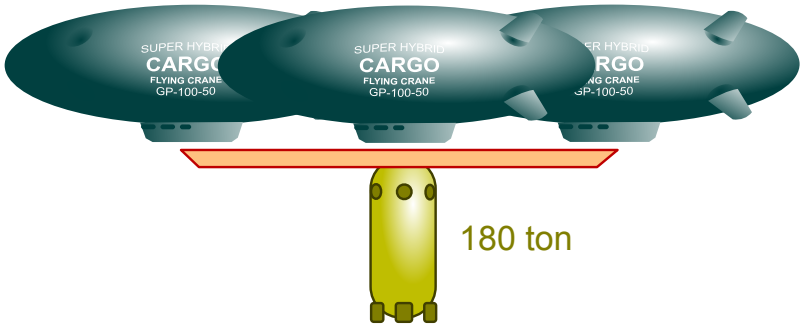

Note that the first method you can, if necessary, combined with the others.

Only a unique set of manageability, security and reliability of super hybrid airships can perform such operations as ordinary.

Let's move on to the estimates ...

Estimates of the cost

To assess the value of serial aircraft at the stage of the concept is very difficult. You can use the analogy and compare the proposed aircraft with helicopters and airplanes of comparable mass. The super hybrid airship is bigger, but is somewhat simpler and does not have such intense and sensitive sites, like the wing or rotor.

The cost of engines expected to lower, as they have not imposed such high demands on reliability as the engines of helicopters and airplanes.

The following are the estimates to be clear that there is not anything extraordinary. No more.

A very rough estimate (in terms of the lease cost) are as follows:

For cargo airship “110 m”
(50 or 25 t payload):

- $ 2,000 per hour
- $ 20,000 in a day
- $ 500,000 in a month
- $ 5,000,000 in a year

For utility airship “50 m”
(3 t payload):

- $ 200 per hour
- $ 2,000 in a day
- $ 50,000 in a month
- $ 500,000 in a year

Estimates of fuel consumption (for the cargo super hybrid airship “110 m”) are shown above in the section "Transport characteristics".

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Assessment of market segments for all world for cargo super hybrid airships (minimum):

- all of the Northern Territory, including Canada, Alaska, Siberia – 30 airships
- sparsely populated territory, including the equatorial jungles, deserts, plateaus – 30
- work in heavy engineering, construction, delivery of heavy goods from factories – 300
- special super hybrid airships (all types) – 50
- military transport – 200

Total – 600 super hybrid airships.

Assessment of market segments for all world for utility (50 m) super hybrid airships (minimum):

- The market segment is the same as the segment of utility helicopters – **300 airships.**

All estimates are made on a minimum.

Utility super hybrid airships (50 m) are discussed further ...

Utility super hybrid airships (50 m)

Let reduce by half the main super hybrid airship ...

The 50-meter super hybrid airship with controllable ballast is very similar to the general purpose helicopter.

Size	**55 x 35 x 20 m**
Size of cabin	**15 x 7 x 2 m**
Empty mass	**7 t**
Body volume	**20 000 m³**
Helium	**8 000 m³**
Ballast	**controllable**
Engines	**4 x 650 hp**
Fuel (normal)	**up to 2.6 t**

Speed (range) ability:

Full speed	(4 x 650 hp)	**120 km / h**	480 km	4 hours
Normal speed	(2 x 650 hp)	**85 km / h**	640 km	8
Middle speed	(1 x 650 hp)	**60 km / h**	960 km	16
Low speed	(325 hp)	**42 km / h**	1280 km	32
Very low speed	(165 hp)	30 km / h	1900 km	64

Limit of weather condition – up to a storm wind 25 m/s. Landing in fog, snow, rain with range of visibility 50 m.

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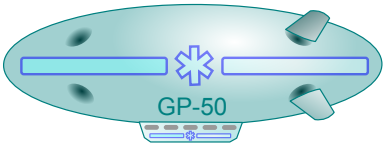
Losing a top speed to the helicopter, super hybrid utility airship has the following advantages:

- much greater safety;
- much greater reliability;
- much greater all weather capability (up to storm);
- much greater comfort;
- low noise;
- anywhere landing, including any slopes, any roofs;
- any weather (snow, rain, gust wind), day and night, long range, long time, very small altitude (30 m), low speed (30 km/h) S & R capabilities with anywhere landing;
- high efficiency at middle and low speed (patrol);



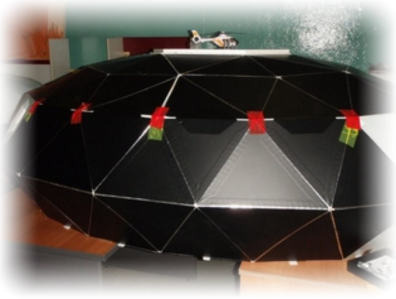
At the stage of R & D this type of super hybrid airship can serve as an unmanned prototype of cargo airships.

Let us sum up ...

Airship GP project

So, project called Airship GP, it seems very logical and very necessary step (may be last step!) towards a universal cargo airship (110 m) and general purposes airships (50 m).

Sizes of new super hybrid airships may be another, for example 75 m, 150 m. But two first types of SH airship yet needs 110-meter cargo and 55-meter utility airships.



Now the project is at the stage of of manufacture and testing of small demonstrators and expansion of patenting.

More technical information available on request.

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Project support in Anchorage workshop by “Dauria Aerospace”.

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For notes ...

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