Boats and vessels on underwater wings with propulsor of oscillatory type

Problems of water transport

Existing types of vessels have many disadvantages: high price, high fuel consumption, low speed and low maneuverability, etc.

In the last decade, the creation vessels of a new type (hydrofoils, ekranoplanes, etc.) did not solved the problem with the profitability of cargo transportation on these vessels, maneuverability, etc.

The main reason of the absence of progress in creating more advanced vessels is that all developments are based on a stationary hydromechanics.

Transition to the establishment of vessels using modes of oscillatory hydrodynamics can provide significant economic, maneuverable, and other advantages compared to modern vessels, using a stationary hydrodynamics.

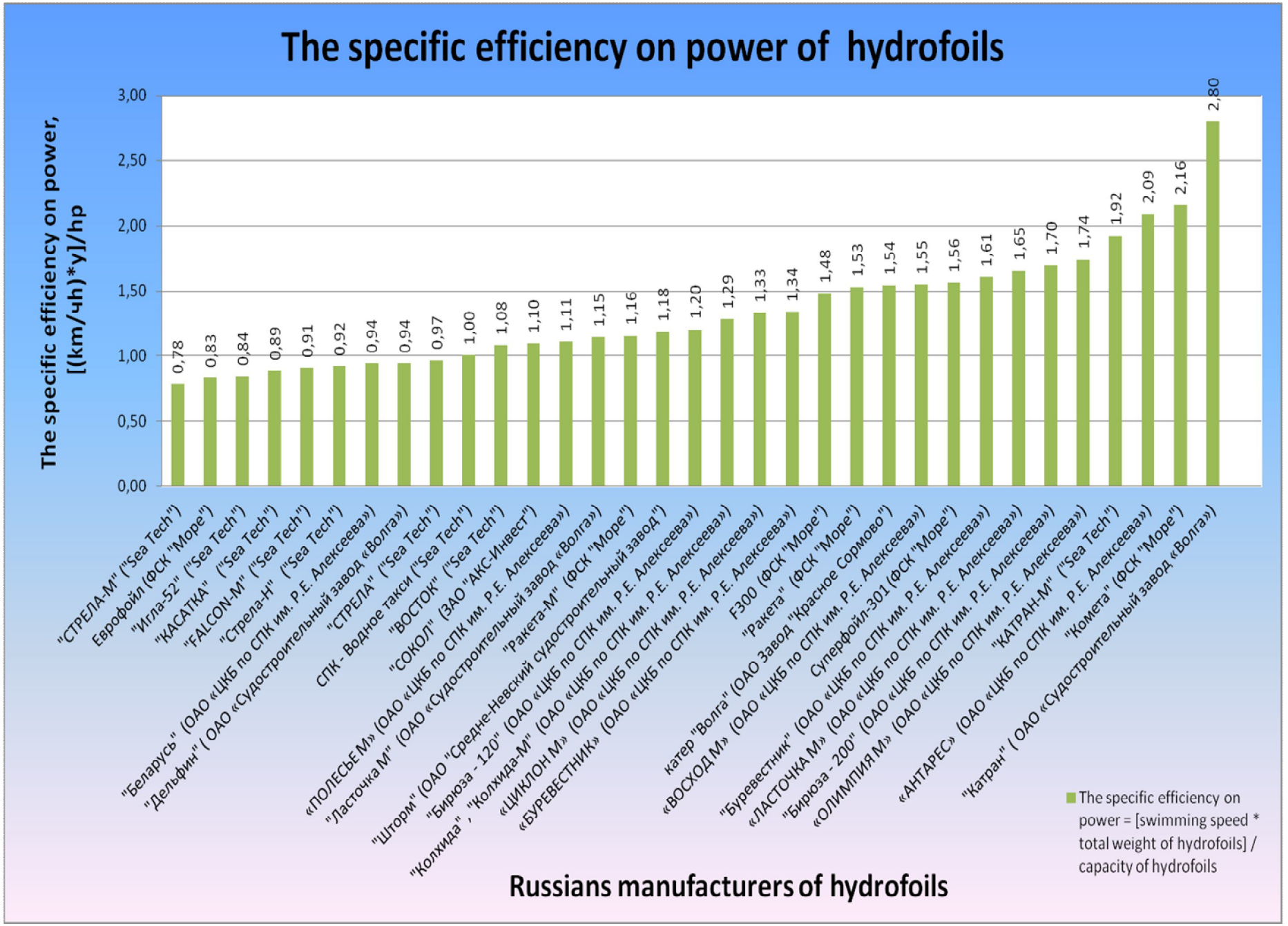
We propose to apply an oscillatory hydrodynamics in the development of boats and vessels of new generation.

We have gathered a large database of hydrofoils and their characteristics are listed below.

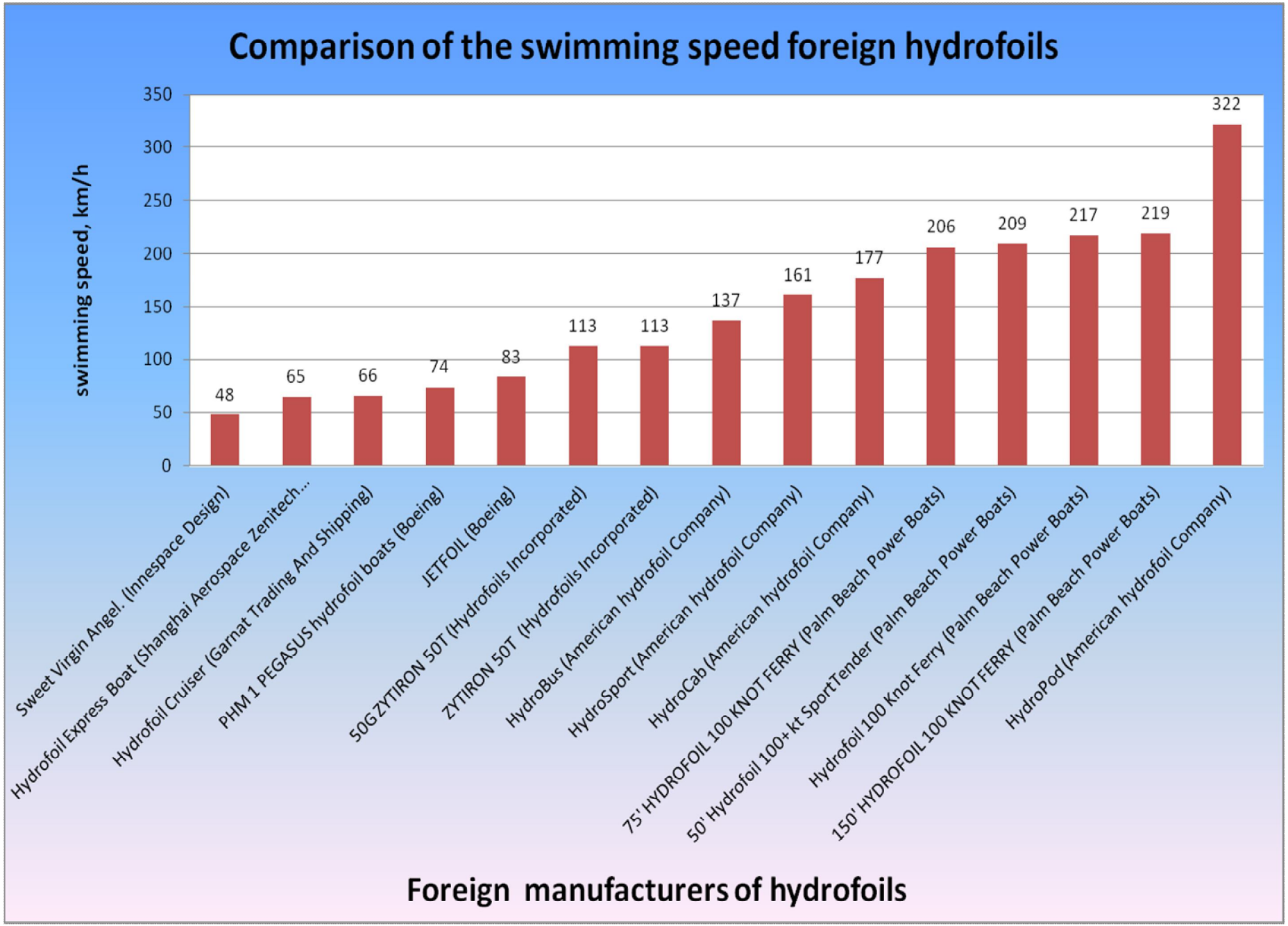
The specific efficiency is used as the main characteristic (vessel speed*vessel weight). Other characteristics are the specific efficiency on the power and specific efficiency on the payload of hydrofoils.

The histograms of these characteristics of hydrofoils are listed below.

Unfortunately, many companies give incomplete information about their hydrofoils , so the histogram shows only those hydrofoils , which had all the necessary characteristics.


The specific efficiency on power of hydrofoils
The specific efficiency on power, [(km/ч)*y]/hp
3,00
2,50
2,00
1,50
1,00
0,50
0,00
0,78
0,83
0,84
0,89
0,91
0,92
0,94
0,94
0,97
1,00
1,08
1,10
1,11
1,15
1,16
1,18
1,20
1,29
1,33
1,34
1,48
1,53
1,54
1,55
1,56
1,61
1,65
1,70
1,74
1,92
2,09
2,16
2,80
"СТРЕЛА-М" ("Sea Tech")
Еврофойл (ФСК "Море")
"Игла-52" ("Sea Tech")
"КАСАТКА" ("Sea Tech")
"FALCON-M" ("Sea Tech")
"Стрела-Н" ("Sea Tech")
"Беларусь" (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
"Дельфин" (ОАО «Судостроительный завод «Волга»)
"СТРЕЛА" ("Sea Tech")
СПК - Водное такси ("Sea Tech")
"ВОСТОК" ("Sea Tech")
"СОКОЛ" (ЗАО "АКС-Инвест")
«ПОЛЕСЬЕ М» (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
"Ласточка М" (ОАО «Судостроительный завод «Волга»)
"Ракета-М" (ФСК "Море")
"Шторм" (ОАО "Средне-Невский судостроительный завод")
"Бирюза - 120" (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
"Колхида" , "Колхида-М" (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
«ЦИКЛОН М» (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
«БУРЕВЕСТНИК» (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
F300 (ФСК "Море")
"Ракета" (ФСК "Море")
катер "Волга" (ОАО Завод "Красное Сормово")
«ВОСХОД М» (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
"Буревестник" (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
«ЛАСТОЧКА М» (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
"Бирюза - 200" (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
«ОЛИМПИЯ М» (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
Суперфойл-301 (ФСК "Море")
«АНТАРЕС» (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
"КАТРАН-М" ("Sea Tech")
"Катран" (ОАО «Судостроительный завод «Волга»)
"Комета" (ФСК "Море")
The specific efficiency on power = [swimming speed * total weight of hydrofoils] / capacity of hydrofoils
Russians manufacturers of hydrofoils


Comparison of the swimming speed Russian hydrofoils
swimming speed, km/h
0
20
40
60
80
100
120
140
55
60
60
60
60
60
60
60
63
63
65
65
65
65
65
65
65
65
65
65
69
70
74
78
80
81
83
85
93
93
100
111
120
120
120
120
СТРЕЛА-М ("Sea Tech")
Еврофойл (ФСК "Море")
Ракета (ФСК "Море")
Ракета-М (ФСК "Море")
Волга (ОАО Завод "Красное Сормово")
ПОЛЕСЬЕ М (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
ВОСХОД М (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
СОКОЛ (ЗАО "АКС-Инвест")
Комета (ФСК "Море")
Дельфин (ОАО «Судостроительный завод «Волга»)
Колхида, Колхида-М (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
Катран (ОАО «Судостроительный завод «Волга»)
СПК - Водное такси ("Sea Tech")
ВОСТОК ("Sea Tech")
Дельфин (ОАО "Средне-Невский судостроительный завод")
Метеор (Зеленодольского завода имени А.М. Горького)
Проект: 1709Р "Беларусь " (ОАО «ЦКБ по СПК им. Р.Е...
Стрела-Н ("Sea Tech")
FALCON-M ("Sea Tech")
КАСАТКА ("Sea Tech")
ОЛИМПИЯ М (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
Бирюза - 200 (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
Бирюза - 120 (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
ЦИКЛОН М (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
СТРЕЛА ("Sea Tech")
проект 206М "Шторм" (ОАО "Средне-Невский...
Ласточка М (ОАО «Судостроительный завод «Волга»)
ЛАСТОЧКА М (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
Суперфойл-301 (ФСК "Море")
F300 (ФСК "Море")
БУРЕВЕСТНИК (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
Буревестник (ОАО «ЦКБ по СПК им. Р.Е. Алексеева»)
АНТАРЕС (ОАО «ЦКБ...
КАТРАН-М ("Sea Tech")
Сокол (ФСК "Море")
Игла-52 ("Sea Tech")
Russians manufacturers of hydrofoils


Comparison of the swimming speed foreign hydrofoils
swimming speed, km/h
350
300
250
200
150
100
50
0
48
65
66
74
83
113
113
137
161
177
206
209
217
219
322
Sweet Virgin Angel. (Innespace Design)
Hydrofoil Express Boat (Shanghai Aerospace Zenitech...
Hydrofoil Cruiser (Garnat Trading And Shipping)
PHM 1 PEGASUS hydrofoil boats (Boeing)
JETFOIL (Boeing)
50G ZYTIRON 50T (Hydrofoils Incorporated)
ZYTIRON 50T (Hydrofoils Incorporated)
HydroBus (American hydrofoil Company)
HydroSport (American hydrofoil Company)
HydroCab (American hydrofoil Company)
75' HYDROFOIL 100 KNOT FERRY (Palm Beach Power Boats)
50' Hydrofoil 100+ kt SportTender (Palm Beach Power Boats)
Hydrofoil 100 Knot Ferry (Palm Beach Power Boats)
150' HYDROFOIL 100 KNOT FERRY (Palm Beach Power Boats)
HydroPod (American hydrofoil Company)
Foreign manufacturers of hydrofoils

Conclusion

Based on the analysis and histograms it can be concluded that the existing types of boats and hydrofoils have a number of significant disadvantages:

- low profitability;
- complex and heavy power drive for propulsors;
- long running start for exit on the underwater wings;
- bad passability;
- bad controllability at small speeds;
- high levels of noise.

But they are used because hydrofoils of better quality are absent.

Our offers

We offer to develop a hydrofoil boat, which have not pushing screw, but instead uses an oscillating slat.

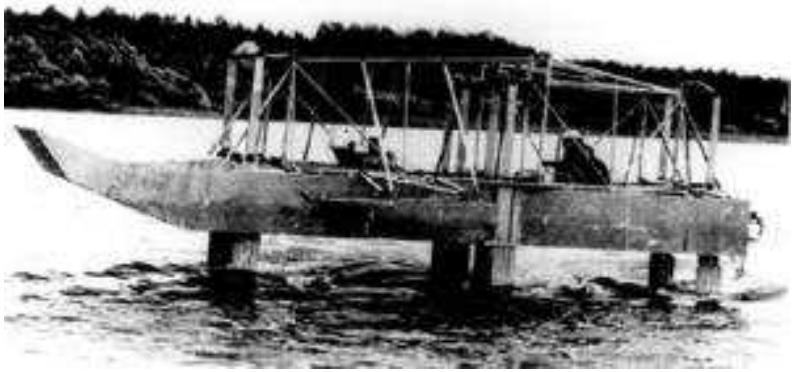
The oscillating slat provides thrust and the same time increases lift force on a fixed wing and reduces its hydrodynamic resistance (KNOW HOW).

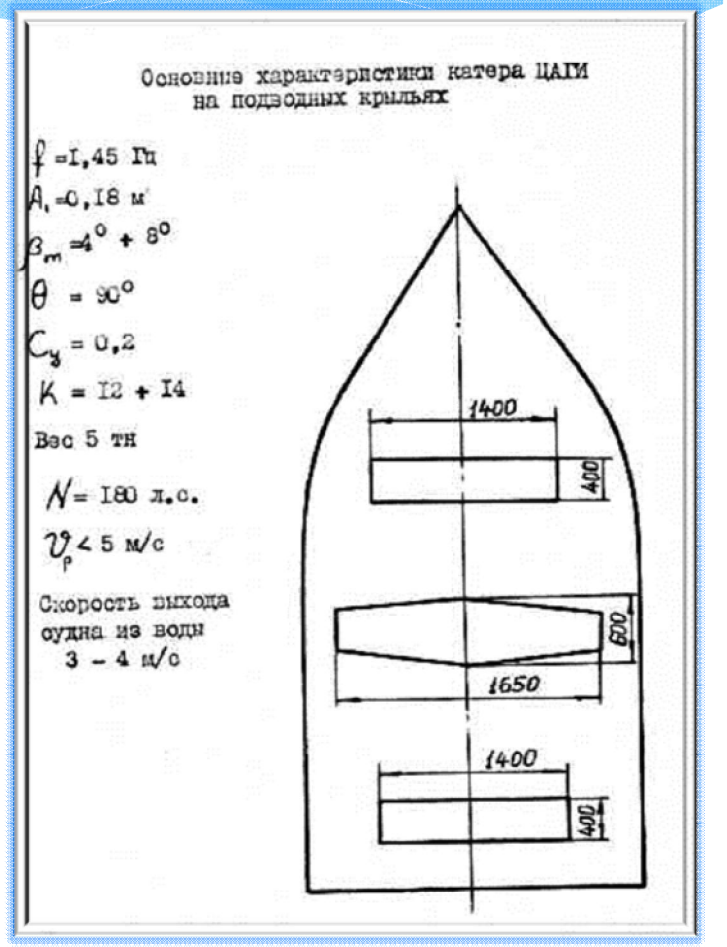
Improved manageability at low speeds and on the spot, a large economy.

Propulsor for the hydrofoils

Boats on underwater oscillating wings developed in the branch of Central Aerohydrodynamic Institute under the direction of Grebeshov. The boat had four oscillating wings, who created both thrust and lift force.

During the test boat overclocked and left under water due to improper installation of angle attack.

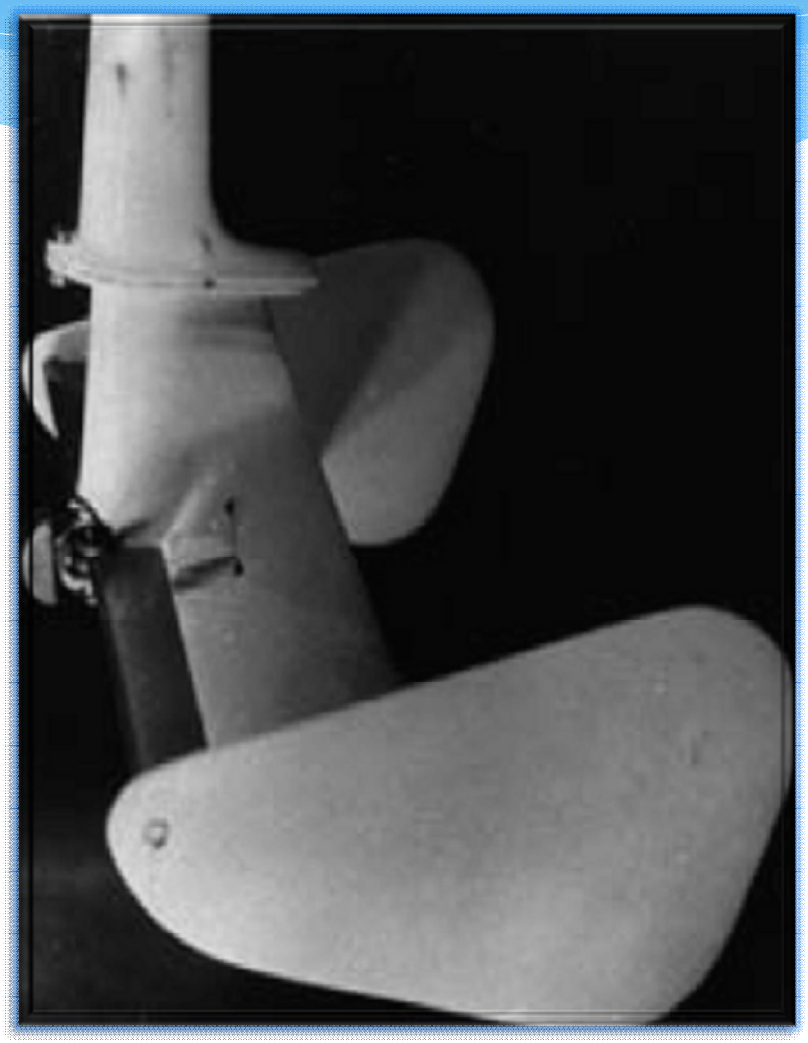




Propulsor - underwater wing with an oscillating slat

Pendant propulsor for the boat was designed and manufactured by Boldyrev in another branch of Central Aerohydrodynamic Institute .

The driving force induces an oscillating wing slat and fixed wing (on which suction force appears).



Advantages of hydrofoil boats with oscillatory thrust compared to conventional

- higher propulsive efficiency
- easier to maintain optimum over a wide speed range of the vessel
- easy control of the computer
- multiple reduced hydrodynamic drag of underwater fixed wing
- possibility of using the energy of sea waves
- less engine power (or more speed at the same power)
- lower fuel consumption and more commercial cargo
- lower transportation costs

Hydrofoil boat with oscillating slats

Marketing and Market Overview

The market of raw materials, materials and components.

Components, materials and raw materials necessary for the manufacture of hydrofoil boats with oscillating wings, are available in the market.

Competition on the sales market

Necessity in efficient and maneuvering high-speed vessels is very high. At the same time produced in the world hydrofoils are expensive and have many other disadvantages. Therefore, they are not in great demand.

Offered by us type of boat (in a subsequent court) has a number of significant advantages over existing types of boats and ships. Therefore, our boat will displace of traditional boats and hydrofoils from the market .

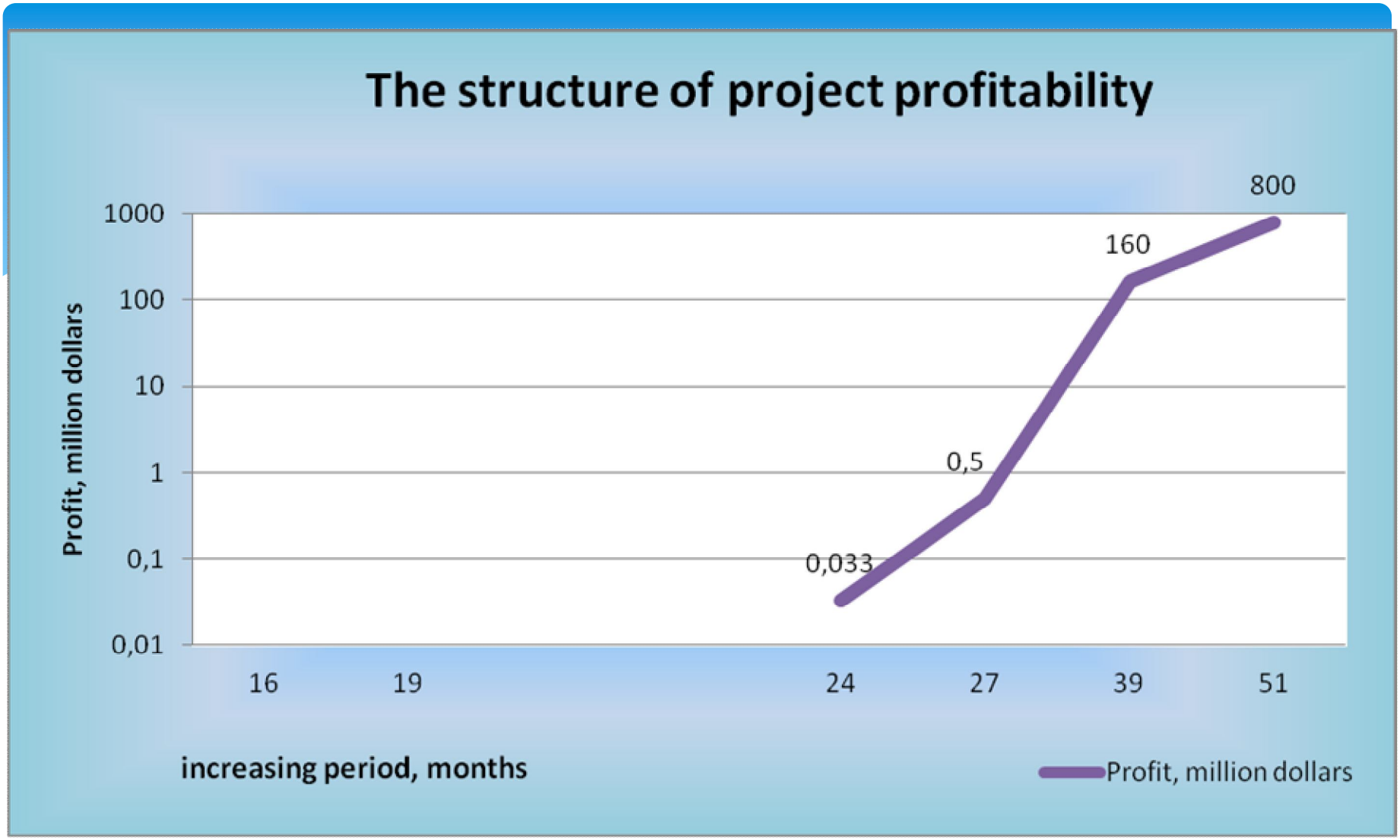
At present on the market, there are more than 100 companies (Russian and international), which produce hydrofoil boats. Each year, one company produces an average of about 100 units. If a boat that will be 2 times more economical will appear on this market then all market will pass on this type of boat. and it is 10000 units a year at least.

Competitive advantages

Hydrofoil characteristics	Hydrofoil boat with the ordinary propulsor	Hydrofoil boat with propulsor of oscillatory type
Steering	**bad controllability at small speeds**	**High maneuverability for any speeds**
Engine	**The usual internal combustion engine paired with reducer**	**internal combustion engine less power (2 times) paired with oil pump**
Power drive	**mechanic**	**hydraulic**
Placement of power equipment	**Next to the screw**	**in any convenient place, thanks to a hydraulic pipelines**
Efficiency of movement	**low**	**high**
Ecological safety	**Screws are a danger to the aquatic flora and fauna, as well as for human**	**Oscillating slats are much safer for people, fish, algae, etc.**

Business plan of development and serial production of boats on underwater wings with propulsor of oscillatory type

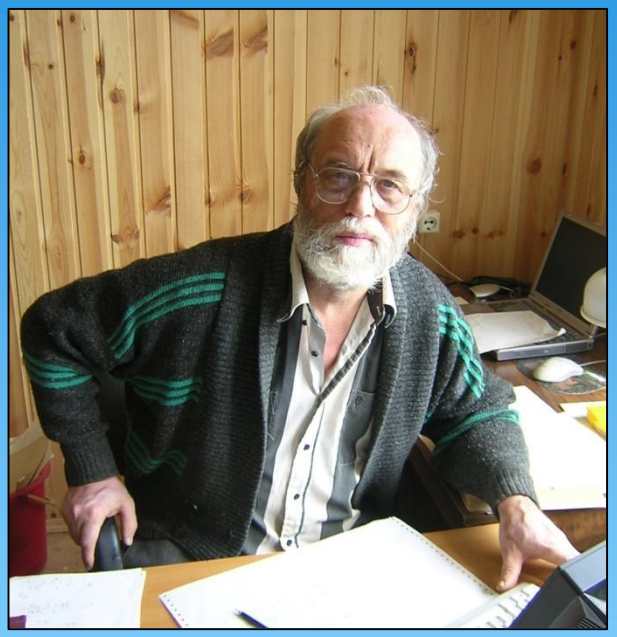
Name of the stage	Duration of the stage, months	Unit cost, million dollars	Quantity, pcs	Expenses, million dollars	Selling price per unit, million dollars	Revenues from sales, million dollars	Profit/ Loss, million dollars	Net profit/ loss, million dollars
R&D of boat for 4 people	16	0	0	**2**	0	0	-2	-2
International marketing	3	0	0	0,033	0	0	-0,033	-0,033
Payment of Know-How	0	0	0	0,33	0	0	-0,33	-0,33
Payment of patent	0	0	0	16,7	0	0	-16,7	-16,7
Production of the 1st batch of boats	5	0,01	5	0,05	0,017	0,08	0,033	0,027
Production of the 2nd batch of boats	3	0,007	50	0,33	0,017	0,83	0,5	0,41
Serial production of boats, 1st year	12	0,004	10000	40	0,02	200	160	131,2
Serial production of boats, 2nd year	12	0,004	50000	200	0,02	1000	800	656
Total:	**51**		**60 055**	259		**1 201**	**941**	769
Profitability (ratio of net profit to all expenses), %								296
The ratio of cost of R & D to the serial selling price of boat for 4 people								100



The graph shows that investments in boat for 4 people start paying off from 24 months from the beginning of investment in R&D.

Profit after 4 years will be around 800 million dollars.

Contacts



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The All-Russian Scientific Research Institute for Electrification of Agriculture (VIESH)

The member of World Council for Renewable Energy (WCRE).

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