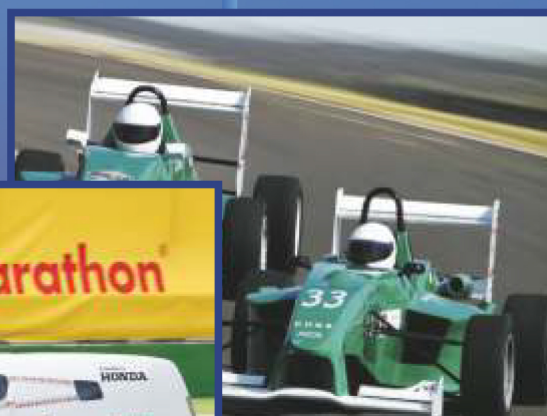


A. M. Turenko, V. I. Klymenko, I. V. Lukashev, O. O. Chernyshov

RECORD-BREAKING RACING CARS KHARKIV NATIONAL AUTOMOBILE AND HIGHWAY UNIVERSITY (LABORATORY OF RACING CARS KHADI)



KHARKIV NATIONAL AUTOMOBILE
AND HIGHWAY UNIVERSITY

A. M. Turenko, V. I. Klymenko,
I. V. Lukashev, O. O. Chernyshov

**RECORD-BREAKING RACING CARS
KHARKIV NATIONAL AUTOMOBILE
AND HIGHWAY UNIVERSITY
(LABORATORY OF RACING CARS KHADI)**

Popular science handbook of racing cars

KHARKIV
KhNAHU
2023

UDC 629.371.21(085)
ББК 39.335.6.Я2
Т86

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T 86 Record-breaking racing cars Kharkiv national automobile and highway university (laboratory of racing cars KhAHI): popular science handbook of racing cars / **A. M. Turenko**, V. I. Klymenko, I. V. Lukashev, O. O. Chernyshov - Kharkiv : KhNAHU, 2023. - 100 p. ISBN 978-617-8009-94-6

KhADI cars are famous throughout the world. The process of designing cars involves both professional designers and enthusiastic students. At different periods of time various types of cars were assembled on the assembly rig of the KhAHI such as sport and touristic cars, electric cars, record-racing cars as well as a cryomobile and an ecoautomobile. More than one record has been beaten by these cars. Due to the KhADI cars Ukraine is a worthy competitor at the international competition «Shell eco-marathon».

The publication is intended for the general reader: both professionals and people who are fond of motor sports.

Автомобілі марки «ХАДІ» відомі в усьому світі. До створення машин залучаються як фахівці-конструктори, так і студенти-ентузіасти. На стапелях ЛША ХАДІ були в різні часи зібрані такі автомобілі: спортивно-туристичні, електромобілі, рекордно-гоночні, кріомобіль та екоавто-мобіль. На цих автомобілях встановлено не один рекорд. Завдяки машинам марки «ХАДІ» Україна є гідним конкурентом на міжнародних змаганнях «Shell eco-marathon».

Видання призначено широкому загалу читачів: як професіоналам, так і людям, які захоплюються автомобільним спортом.

UDC 629.371.21(085)
ББК 39.335.6.Я2

ISBN 978-617-8009-94-6

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**Повне видання можна придбати на кафедрі автомобілів
в Харківському національному автомобільно-дорожньому університеті
(вул. Ярослава Мудрого, 25, кімната 104, тел. (057) 700-38-77)**

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at the Kharkiv National Automobile and Highway University
(Yaroslava Mudryho St., 25, room 104, tel. (057) 700-38-77)**



INTRODUCTION

HADI cars

«HADI» brand cars are known all over the world, these are both high-speed cars and special-purpose vehicles, but the most important thing is that they were and are being created not only by professional designers with higher education, but mainly by students.

The first high-speed car «HADI-1» appeared in 1952. L. Kononov's diploma project was taken as a basis. The institute's students such as L. Komarov, V. Litovko, and I. Bovyachenko helped him. The republican speed record of 146 km / h at a walking distance of 1 kilometer was set on this car.

In 1959, a self-taught designer V.K.Nikitin was invited to work at the institute. At that time, Vladimir Konstantinovich had already created several «Kharkov» series high-speed cars.

The first car, created in KhAHI in 1961 under the leadership of V.K. Nikitin, was «KHADI-2». The body of the two-seat sports-tourer was made of fiberglass. Almost two decades later, in 1980, another two-seat sports-tourer «HADI-15» was developed. N. Semenenko, the HSRCL head, provided the work on its creation.

The high-speed car «HADI-3» was released in 1962. The author of the project was a graduate student T. Utemov. The car turned out to be so miniature that it was entered in the Guinness Book of Records, and it was remained as the world's smallest record-racing car.

The «HADI-4» car was created in 1963 as a car for setting speed records, two Ukrainian records were set on it. But his fate was short: during the test on Baskunchak, the tire of the left rear wheel burst. The car took off to a height of 8 meters, fell and ignited, it was not possible to extinguish it completely.

The record-racing car «HADI-5» (1966) was designed according to the drawings of the car «HADI-4», but differed in the design of the engine and transmission. The car lived a long sports life: all-Union records were set on it, two of which exceeded world achievements. And when the car exhausted its capabilities, the decision to rebuild it into an electric car was taken.

At the same time, V.K. Nikitin continued to improve the high-speed cars «Kharkov», created by him even before joining Kharkov automobile and highway institute. The sixth regular HSRCL model of HADI cars received his significantly modified «Kharkov-6».

The high-speed car «HADI-7» was created in the laboratory of high-speed racing cars in 1966, the author of the project is V.K. Nikitin. The car was a former «Kharkov-7», where the piston engine was replaced by a helicopter gas turbine engine. The estimated speed of «HADI-7» was over 400 km / h, and it was reached, but was not officially registered due to the absence of an international commission. Nevertheless, at the Chuguev airfield, V.K. Nikitin set four all-Union records that exceeded the international achievements of that time.

In 1967 in the HSRCL, «HADI-8» was created for touring. During the competition, the car was seriously damaged. During 1971 - 1972 it was restored with the preservation of the previous parameters, but with major design changes and was named «HADI-10».

V.K. Nikitin made his dream of creating a super-high-speed car true in «HADI-9», which had a jet engine, in 1978. The design was based on a complex graduation project of students of KhAHI S. Sherstobitov, A. Zagovora, V. Segodin, A. Korlyakov and A. Pudrik. But he did not succeed in overtaking the sound, since at that time in the USSR there was no corresponding route on which an estimated speed of 1200 km / h could be developed. But the car became the «hero» of Dmitry Svetozarov's film «Speed», having received the name «Igla-02SR» during the filming.

«HADI-5», re-equipped with the active participation of Yu.K. Stebchenko in the electric car «KHADI-11E», was launched in 1973. Yuri Konstantinovich set two all-Union speed records on it, one of which exceeded the world one, the third record was set by student V. Gavrilenko.

The record-racing electric car «HADI-13E» was created between 1974 and 1976, the design of the car was based on the shape of one of the early versions of the jet car «HADI-9». In October 1977, three new all-Union speed records were set on it, two of them were higher than the world ones.

Subsequently, «HADI» electric vehicles were manufactured under the guidance of Yu.K. Stebchenko, the HSRCL senior engineer. In 1983, a new record-racing electric car «HADI-21E» was developed. It was designed using the chassis of the «HADI-10» car. HSRCL students O. Rubanov and V. Elizarov worked on the creation of the vehicle. In the fall of 1983, an all-Union speed record was set on an electric car, which was also a world record for electric vehicles.

The record-racing electric car «HADI-23E», created in 1984 under the leadership of Yu.K. Stebchenko, was a modernized version of the electric car «HADI-21E».

Between 1985 and 1987 in the HSRCL, an electric dragster «HADI-28E» was manufactured. Its development was also provided by Yu.K. Stebchenko. An electric motor from an anti-submarine torpedo was used as a power unit. «HADI-28E» did not take part in record races, but performed only demonstration races.

«HADI-24» car opened a new generation of record-racing dragster cars constructed by HSRCL in KhAHI in the 1980s. O. Rubanov, A. Kovalenko, I. Lukashev, students, M. Grinenko, an engineer, worked on the creation of the car. Four all-Union speed records were set on «HADI-24» car.

The record-racing dragster car «HADI-26» was created in 1985 in HSRCL. The designers were G.G. Bilis, A. Kovalenko, P. Boroday, I. Lukashev, M. Grinenko, I.N. Voeikov, J. Tsvibel. The «HADI-26» car took part only in demonstration races.

A new dragster «HADI-27» project was worked on between 1985 and 1986 in HSRCL, the laboratory was supervised by G.G. Bilis. The car was exhibited at in Plovdiv (Bulgaria), as well as at the exhibition of scientific and technical youth creativity in Moscow in 1987.

From 1988 to 1990, HSRCL employees worked on the design of a racing car for touring and in 1991 the car was constructed in eight months. All the members of HSRCL team worked on the project - I.V. Lukashev, E.V. Volyansky, M.N. Grinenko, V.A. Kapsheev, G. Zhuchenko, A. Shevchenko, V. Bovt, I. Kanishchev. In the fall of 1992, «HADI-29» car became a regular participant in the Ukrainian Championships on touring car racing, the HSRCL team received many awards.

«HADI-31» car was developed by the University specialists, it was constructed in a single copy. It debuted in the final round of the 2006 Touring Championship.

KhNAHU students were actively involved in the design of a «HADI-33» vehicle. The car was built in 2009, tests were carried out at the Chaika autodrome. Since then, it has repeatedly taken part in the Ukrainian touring championships. In 2002-2004, specialists and scientists of the KhNAHU and B. Verkin ILTPE of NASU created the first Ukrainian scale model of an environmentally friendly car - an experimental model of a cryogenic car (cryomobile) running on liquid nitrogen. The project was assigned serial number 32. At different times I. Lukashev, I. Kanishchev, S. Karnaukh, D. Eksperiandov, A. Chernyshov, A. Klunny worked on the project.

In January 2009, Business Ukraine magazine allocated funds for the construction of a new HADI car, which was assigned serial number 34. The team made its debut in 2010 with the support of Honda in Ukraine on a specialized track EuroSpeedway Lausitz (Germany). The car was piloted by the author of the technical ideas of the project A. Sergienko and E. Khmelnitsky, the leader of the team was A. Chernyshov. For the result shown during the competition - the ability to overcome 570 km consuming one liter of gasoline - the car «HADI-34» was entered in the Ukrainian Book of Records.

A series of «HADI» cars do not stop there. The assembly of new unique cars continues on the stocks of KhNAHU HSRCL...

KhADI-1



Year of manufacture
1951

The History of Creation

«KhADI-1» is the first record-racing car designed by KhAHI students. The car was made of available components with a motorcycle engine M-72. The calculated maximum speed was 150 km/h. The car was made according to L. Kononov's project. He was helped by his fellow students L. Komarov, V. Litovko, I. Bovtachenko, V.K. Nikitin was a consultant.

L. Kononov is famous in the automobile area as a creator of the first cart car in the Soviet Union. Lev Sergeievich Kononov (19.09.1927 – 02.07.1967) was a sport coach in carting from Kursk, the founder of the youth carting in the USSR. He was born in Tambov. In 1934 he moved to Kursk, there he finished compulsory school № 11, got fond of engineering modeling. In 1947 he left vocational school with the speciality of a fitter, turner, miller and welder. He worked on the truck at one of the motor depots of Kursk, then he entered Kursk railway technical college and attended the amateur flying club in the evenings. He is a graduate of Kharkiv Automobile and Highway Institute. During the study he was the member of the team that created a racing car «KhADI-1», driving which he set up a record of Ukraine in the racing for 5 km. In 1958 L. Kononov organized an experimental laboratory of micro-cars in Kursk House of Pioneers. Under his guidance the children constructed mini cars «Kursk» and «Sputnik» and a tourist mini bus «Tovarishch». In 1960 L. Kononov designed the first in the USSR sport mini car for children «Cart». In 1967 he supervised training of the National Team of the RSFSR to the 4th sports festival of the USSR peoples, he was appointed the coach of the National Team of the Soviet Union in carting. He died suddenly during the competition in carting in Kursk.



Work at «KhADI-1»



Lev Kononov near the «new-born»



In the Gorky Park

RECORDS AND AWARDS

Participating in races for establishing speed records in 1952-1954, L. Kononov set up a republican record on «KhADI-1» – 146 km/h at the distance of 1 km with stroke. The Institute was awarded a Merit of the Sports Committee of the USSR for creation of this car.

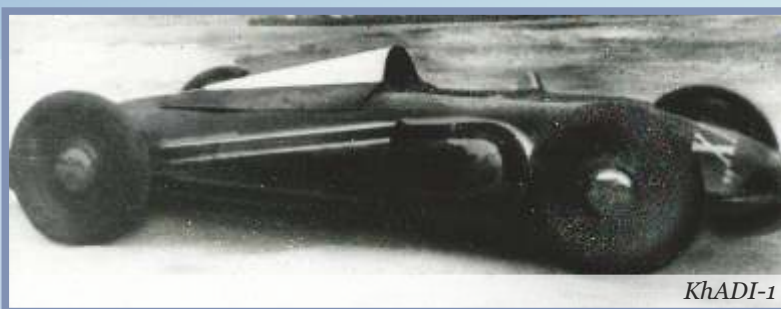
Creation of «KhADI-1» initiated multi-year work on the developments of racing cars by KhAHI students. Later the students interested in car racing were united in a Students' Designing Bureau.



In front of the Institute building



KhADI-1



KhADI-1



Rector B.V. Reshetnikov is estimating the results of the students' work

Specifications of «KhADI-1»

Frame	pipe, fabricated
Body	home-made, duralumin
Type of body	open
Number of doors	none
Number of seats	1
Length, mm	4000
Width, mm	1200
Height, mm	950
Wheelbase, mm	2500
Front track, mm	no data
Rear track, mm	no data
ENGINE	motor-cycle M-72
Engine location	Inboard, longitudinally
Working volume, cm ³	746
Type of cylinders location	opposed
Number of cylinders	2
Piston stroke, mm	78
Cylinder diameter, mm	78
Degree of compression	8
Gas distribution mechanism	SV (Side Valve)
Number of valves for a cylinder	2
Fuel feed system	2 carburetors, without a supercharger
Manifold pressure	none
Capacity, h.p.	30
Torque, H.m.	62
Fuel	petrol
SUSPENSION	
Front suspension type	independent, with upper transverse spring
Rear suspension type	conventional suspension
STEERING	
Power steering	none
Type of steering	worm
Turning circle	no data
Clearance, mm	no data
Mass, kg	400
Calculated maximum speed, km/h	150
Tyres identification	4.5 – 16"

KhADI-2



Year of manufacture
1959-1961

In the exhibition hall of the Laboratory of Racing Cars

The History of Creation

«KhADI-2» was built in 1961 by the Students Designing Bureau (SDB) at the automobile faculty of KhAHI under the leadership of the Master of Sport V.K. Nikitin as an experiment for the development of new materials and technologies.

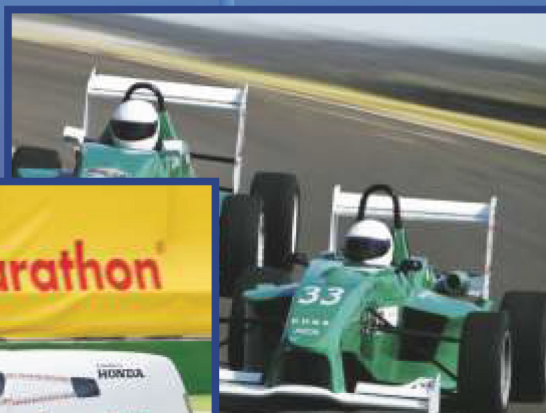
The car «KhADI-2» is the first tourist class car with a fiberglass body in the USSR. «KhADI-2» model is a two-seater convertible of a little more than 4 meters long.

The body has no doors and it is made by fiberglass inset of 10 layers on a full-size plaster model coated with separating layer of paraffin. The function of carcass is performed by a frame welded of shaped tubes. As a result, the car mass is less than 500 kg.

The engine with the clutch from the motorcycle «M-72» was taken for «KhADI-2». The engine is two-cylinder, opposed and flat-head. The main units and components – chassis, front suspension and steering, transmission system and rear axle – were borrowed from the series «Moskvich-402», as well as a large part of exterior decoration - the bumpers, grille, rear lights, headlamp rims, lampshade illumination of a licence plate.

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KhADI-37

Year of manufacture
2016-2021

The History of Creation

HADI-37 project started in 2016. Under the leadership of the head of the laboratory of high-speed cars I.V. Lukashov and with the participation of E.V. Volyansky, E.L. Savchenko, I.N. Kanishcheva, V.G. Atamanyuk, made a car designed to participate in races for short distances, as well as for experiments related to the study of maximum accelerations. The car has a modular design. The front and middle modules are built using the experience of creating cars for circuit racing.

The design of the rear module made it possible to use a V-shaped eight-cylinder ABZ engine and special wheels designed to achieve maximum acceleration. Students engaged in the creation of the car at that time in the laboratory of high-speed cars were V.M. Babay, D.Yu. Morozovsky, M.V. Makhonin, V.V. Godz and M.O. Solovyov worked over the car.

Specialists of automobile sports «Renault Club Kharkov» M.S. Shcherbak, D.O. Zvyagin and S.V. Podnos provided methodological and practical assistance in the development, installation and adjustment of electronic engine control units and car telemetry.

The car was made in 2021.



Specifications of «KhADI-37»

Frame	pipe, fabricated
Body	Fairing of composites
Type of body	open
Number of doors	none
Number of seats	1
Length, mm	4100
Width, mm	1900
Height, mm	1100
Wheelbase, mm	2400
Front track, mm	1500
Rear track, mm	1450
ENGINE	based on «Volkswagen» ABZ
Engine location	average
Working volume, cm ³	4200
Type of cylinders location	V
Number of cylinders	8
Piston stroke, mm	94
Cylinder diameter, mm	81
Degree of compression	10,5
Gas distribution mechanism	«DOHC»
Number of valves for a cylinder	4
Fuel feed system	Electronic Distributed Injection
Manifold pressure	none
Power, h.p.	220
Torque, N.m.	500 by 5100 rpm
Fuel	A-98
TRANSMISSION SYSTEM	КПП AKL
Clutch	One disc dry clutch
Drive	rear
Number of gears	5
SUSPENSION	
Front suspension type	on double wishbones
Rear suspension type	on double wishbones
STEERING	
Power steering	none
Type of steering	rack-and-gear
Turning circle	no data
Clearance, mm	60
Mass, kg	600
Calculated maximum speed, km/h	240
Size of the front tires	180/500 R13
Size of the rear tires	250/650 R15
Brakes	Braking mechanisms - front and rear disc, original design

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*Sergienko A.V., Morozovsky D., Nikulin Yu.,
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MODERN HIGH-SPEED RACING CARS LABORATORY (HSRCL)

The development of motor transport in Ukraine has a huge scientific and technical potential. On the basis of HSRCL the touring car team was created. They continuously took part in the Ukrainian Championships. For ten years, this team has become a champion and they are objectively a motorsport long-liver and one of the most productive motorsport teams in Ukraine.

Speed has always attracted brave and temerarious young people. It is very important for each of them to see the fruits of their labor, and this becomes possible when conducting training trips of racing cars, at first as mechanics, and then as pilots. Participation in the Ukrainian championship is of great importance for each of the enthusiastic guys.

Today, the team's pilots are students, and they participate in competitions riding not production cars, but the cars they actively created themselves. And they do not compete with their peers in terms of age and experience, but with people who have dedicated five, ten, thirty years to motorsport.

HSRCL is a business card of our glorious KhNAHU, and the students who have finished this school, are the pride of our HEI!

The authors are grateful to Volyansky E.V, Savchenko E.L, Sergienko A.V for assistance in preparing this publication material.

Науково-популярне видання

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РЕКОРДНО-ГОНОЧНІ АВТОМОБІЛІ ХНАДУ (ЛІША ХАДІ) Науково-популярний довідник швидкісних автомобілів (англ. мовою)

Відповідальний за випуск Д. М. Леонт'єв
Редактори: Н. П. Книщенко, Н. В. Саєнко
Комп'ютерна верстка: Д. Ю. Нерівня

Дизайн: К. Ю. Міхалькевіч
Дизайн обкладинки: О. О. Лепьохіна
Фото: К. Ю. Міхалькевіч, Л. В. Максимцов