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## LIFE AND SCIENTIFIC ACHIEVEMENTS OF ALEXANDER IVANOVICH KUKHTENKO

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Crossing the threshold of the National Aviation University, hardly anybody could even imagine that thousands of talented people used to work and carry on creating here up to now.

Not only the staff of the university but the whole Ukrainian nation can proud of them.

In March, 11, 2014, the academician of the National Academy of Sciences of Ukraine, Honoured Worker of Science and Technique, the Doctor of Engineering Sciences, Professor Alexander Ivanovich Kukhtenko is just going to turn 100 years since the date of his birth.

Alexander Kukhtenko is an outstanding scientist in the field of the Abstract Theory Systems, namely the Mechanics and Technical Cybernetics. His research interests comprised issues of Informatics and Informatization of the society, Methodology and History of Science.

Alexander Ivanovich Kukhtenko was born in March, 11, 1914, in Gorodnia of Chernihiv province, in the family of a mathematician teacher.

In 1928 Alexander graduated from the septennial school in Luhansk and at the age of fourteen years old he entered the vocational school owned by the state Locomotive manufacturer in Luhansk.

In 1932 he successfully passed his entrance exams and was enrolled as a student to the Industrial Institute.

In 1936 he got a diploma with distinction and qualification of an electrician engineer.

After having got his diploma Alexander Kukhtenko stayed at the Institute, where he started working as a lecturer assistant in the Department of Theoretical and Applied Mechanics.

In May, 1941, a young scientist defended his thesis on the theme: "Automatic Control by Mine Turbo-Machines".

However, being highly motivated as a researcher, he decided to continue his studies at the Moscow State University.

But he failed to achieve his goal due to the beginning of the Second World War – he participated in battles carried out at the First and Fourth Ukrainian fronts.



Alexander Ivanovich Kukhtenko

For courage and heroism Alexander Kukhtenko was decorated with a medal of Red Star and many other decorations.

In 1946 he was demobilized and came back to research projects. As a senior staff researcher of the Mountain Mechanics Institute Academy of Sciences of Ukraine in Kyiv, he opened a research laboratory on automation issues.

In 1954 Alexander Kukhtenko defended his doctorate thesis on development of the Automatic Control Systems by Mine Machines.

In 1956 Alexander Kukhtenko returned to his teaching activities.

He became a professor at the Department of Mathematics, Theoretical Mechanics and Automation of the Kyiv Institute of Civil Aviation, where he taught the course "Theoretical Mechanics" and "Automation and Remote Control".

Later he became the head of that department. Simultaneously he worked as a lecturer of courses on the Dynamics of Nonholonomic Systems and Dynamics of Control Systems at the Kyiv State University named after Taras Shevchenko.

In 1957, at the Faculty of Electrical Engineering (later renamed as the Department of Management Systems) he organized and headed the Department of Theory of Automatic Control and the Aviation System where he had worked for over 20 years.

Alexander Kukhtenko, together with the staff of the Department, in the short term have been created three research laboratories, also designed and equipped for training purposes.

The textbooks and laboratory manuals on more than five courses were written and published to provide quality teaching of students.

In addition to the University students, Alexander Kukhtenko delivered lectures also for engineering companies and flight departments of civil aviation providing training and retraining of their personnel.

Alexander Kukhtenko paid great attention to young researchers. He delivered valuable lectures on Modern Control Theory for the post graduate students and young scientists.

Lecturing activities as well as personal communication with the post graduate students and young researchers had a great impact development of scientific thinking of the Institute's graduates.

Alexander Kukhtenko had been a research supervisor for many scientists.

In Kyiv Institute of Civil Aviation five Doctors of Science and more than 20 Doctors of Philosophy have been prepared by him. During his professional career he had supervised research projects of more than 12 Doctors of Science and 40 Doctors of Philosophy.

Alexander Ivanovich Kukhtenko (1956 - 1980) had worked at our University for 20 years. He was a head of the Department, Vice-Rector for Research work, Scientific Director of several industrial research laboratories ("Flight Simulators" and "Automated Air Traffic Control System", etc.).

For many years the laboratories have been the main research centres directed by the Ministry of Civil Aviation of the former USSR.

Research interests of Alexander Kukhtenko comprised a number of fundamental research areas: Dynamics of Nonholonomic Systems, the Theory of Invariance, the Abstract Theory of Systems, Multidimensional Control Systems, Problems of Informatics and Society Informatization.

His scientific work is characterized by a combination of theory and pragmatics, fundamental research and its results practical application.

His theoretical research has been always focused on specific and practical goals to improve the aeronautical equipment.

Such projects as the Strapdown Inertial Navigation System for civil aircraft, complex aircraft flight simulators, automated air traffic control systems have been among them.

For efficient use of small BINS it was needed to have reliable high performance computing machines that could work continuously without errors within 10-20 hours of flight.

For this purpose in 1962 a Computationally-digital Differential Analyzer with ternary coding system increments has been developed for the first time in the former USSR.

The new device was free of so-called phase and other types of errors characteristic for control of digital computers.

Further improvement of the device to provide better base for Strapdown Inertial Navigation System Computationally-digital Differential Analyzer test to be further manufactured had been undertaken at the Institute of Cybernetics of Ukrainian Academy of Sciences under the supervision of Professor Kukhtenko.

At the Department of Scientific and Industrial laboratories an intensive research on both simulators was conducted.

Those works were among the first in the country and were aimed at creating integrated domestic flight simulators.

The scientific research was conducted and its results were used in complex simulators Il-14, An-2, An-24, Il-18, Tu-134, Tu-154, Yak-40 and others.

In each generation one can find many gifted people.

The people, having achieved much in their carriers become well-known and even popular. And only some of them manage to leave a lasting mark in the history.

Many Ukrainian scientists worked for solving specific complex scientific and technical challenges connected with the space exploration. Among them, a special place belongs to Alexander Ivanovich Kukhtenko.

At the beginning of the sixties of the last century in the former USSR a state Program on creating spacecraft for a manned return flight to the moon

and landing on its surface was being implemented in full swing. That project required more specialists on issues of the space exploration, scientists, designers and engineers.

The Kyiv Institute of Civil Aviation Engineers was tasked to invent a unique training equipment to train astronauts to fly to the moon and other planets.

The task was completed under the supervision of Alexander Kukhtenko.

It should be noted that the simulator invented worked as a real world device. That is why so much attention was paid to the training of astronauts to fly by manned spacecraft.

At that time there was an idea to design an integrated simulator for both astronauts and pilots. For this purpose and under the supervision of the Institute and Alexander Kukhtenko the Modeling Research Center was created.

The Center had to solve complex scientific and organizational tasks in a short time period.

For provision effectiveness of that important work the Kyiv Institute of Engineers of Civil Aviation was appointed to be responsible for the entire scope of work for the development of integrated simulators including the whole range of tasks – from the solving of the scientific and technical problems, mathematical models, technical documentation to the monitoring of the production cycle including manufacture of specific equipment at factories and opening experimental design offices in Kyiv, Moscow, Leningrad, Lvov and Chisinau, which were subordinated to different Ministries and State Departments.

It was necessary to create a functional simulation system, which would allow modeling the dynamics of flight, landing on the lunar surface and coming back using the lunar space module operating by both automatic and manned modes.

Another task was to create a large-scale model of a certain area of the lunar surface. Despite all challenges a simulator of the spacecraft performing landing and returning from the Moon named “Sirius” was created.

Two simulators “Sirius” were approved by the State Commission.

One of them was installed in the R&D production facility “Energy”, and the other one - in the Cosmonaut Training Center.

Unfortunately after Sergei Korolev’s death the program of the manned missions to the Moon has been reoriented on its research automatic stations.

Though for many years the simulator “Sirius” had been used to train astronauts.

After some modernization the simulator was used for training purposes of Soviet and American astronauts for the Apollo-Soyuz test project.

The work was done with the help of the Kyiv Institute of Engineers of Civil Aviation.

Simultaneously with that ambitious project Alexander Kukhtenko led the research to improve the stability, handling and fuel efficiency of aircraft using mathematical modeling methods.

Significant results were obtained when studying stages of testing supersonic aircraft Tu-144.

After getting the results, Chief designer A. Tupolev was recommended to make some changes in the aircraft design.

Later those ideas were used in aircraft Concorde.

Working for the Kyiv Institute of Engineers of Civil Aviation, Alexander Kukhtenko was also the Head of Department of Technical Cybernetics, Institute of Cybernetics named after V. Glushkov, Ukrainian Academy of Sciences, and the Deputy Chairman of the Scientific Council on Problems of Cybernetics (1963–1985).

He was awarded twice the State Prize of Ukraine in the field of science and technology for outstanding contribution to the development of new research directions and contribution to important national economic tasks, he became a laureate of the National Academy of Sciences of Ukraine named after V. Glushkov, he was awarded two Orders of the Red Banner, the gold medals of Yurii Gagarin and Sergei Korolev and the Diploma of the Presidium of the Supreme Council of Ukraine.