

УДК 351.852.1:629.73:378.662(477-25)

Reflection of the history of aviation of Ukraine in the exposition of the State Polytechnic Museum at NTUU “KPI” as a component part of preparation of future aircraft engineers-constructors

Відображення історії авіації України в експозиції Державного політехнічного музею при НТУУ «КПІ» як складова частина підготовки майбутніх авіаційних спеціалістів

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Ключові слова:

освіта, Державний політехнічний музей при Національному технічному університеті України “Київський політехнічний інститут”, спадщина, історія авіації і космонавтики, авіаційно-автомобільні майстерні, університетський музей.

Анотація: В статті розповідається про історію створення і принципи роботи відділу Історії авіації і космонавтики Державного політехнічного музею Національному технічному університеті України „КПІ”. Особливістю експозиції музею є його унікальне розташування на місці багатьох подій, що відбувалися в безпосередній близькості від нього – побудова першого в Російській імперії літака вітчизняної конструкції (викладач КПІ князь О. С. Кудашев), а також великої кількості літаючих апаратів оригінальної конструкції – планерів, дирижаблів, літаків, гелікоптерів – разом приблизно 40 типів – більше ніж в будь-якому іншому місті колишньої Російської імперії. В КПІ в різні часи навчалися і починали свою практичну діяльність багато видатних в майбутньому конструкторів вітчизняної і світової авіаційної і космічної техніки – І. І. Сікорський, Д. П. Григорович, К. О. Калінін, А. М. Люлька, С. П. Корольов і багато інших. Вивчення історії розвитку в Україні найшвидшого виду транспорту, для якого не потрібні шляхи і для якого не існують перепони – авіації – прищеплює майбутнім інженерам-авіафахівцям почуття гордості за свою країну і виховує гармонійну особистість – професіонала своєї справи.

Key words:

education, State Polytechnic Museum at the National Technical University of Ukraine „Kyiv Polytechnic Institute”, heritage, history of aviation and cosmonautics, automobile and aviation workshop, university museum.

Abstract— In the article the history of creation and principles of the work of department “The history of aviation and cosmonautics” of the State polytechnic museum of Ukraine at the National Technical University of Ukraine „Kyiv Polytechnic Institute” has been described. The feature of the exposition of the Museum is in its unique emplacement in place of many events which took place in a direct closeness from it. Among them there are a building of the first airplane of native construction in the Russian Empire (by professor KPI prince Oleksander Kudashev), and also a large number of flying vehicles of original construction – gliders, dirigibles, airplanes, helicopters – all approximately 40 types – more than in any other towns of the former Russian Empire. In different time periods in the KPI many prominent designers of ukrainian, soviet and world aviation and space technique studied and began his practical activity – Igor Sikorsky, Dmitry Grigorovich, Kostyantyn Kalinin, Arkhip Lyulka, Serhiy Korolev and many others. Study of the history of development in Ukraine of aviation – the most rapid type of transport which doesn’t need roads and there are not the obstacles for it – inoculates future engineers-airspecialists sense of pride for their own country and educates harmonic personality – business professional.

Every industrial developed state has or aims to have the national technical museums. The attempts of creation of polytechnic museum in Ukraine arrive at in the end of the XIX-th century, when with foundation of higher technical educational establishment of new type – the Kyiv Polytechnic Institute – there were numeral attempts to create the museum of history of science and technics in it. It was reflected in organization educational-auxiliary establishments – a few cabinets from certain industry. In

Soviet period of history the numeral attempts to create a polytechnic museum in Ukraine also were failed.

And only on May, 29 in 1995 to the 100-th anniversary of foundation of the Kyiv Polytechnic Institute on the base of the Republican Museum of Casting Production at National Technical University of Ukraine “Kyiv Polytechnic Institute” (NTUU “KPI”) the State Polytechnic Museum was founded (Decision of Government of Ukraine № 360). The Museum opened the display halls for visitors on September, 11 in 1998. To this

time the laborious was three years conducted and responsible repair-restoration work from adaptation of apartments of the left wing of ground floor of building № 6 – former mechanical workshops of KPI – under the first turn of display of museum.

Today the State Polytechnic Museum is the unique in Ukraine establishment, where a history of becoming of basic industries of native technique is presented, payment of Ukraine in history of development of technique in the world.

In the museum there are fourteenth sections which describe a history of technique in different directions: electronics, instrument-making, radio engineering, telecommunications, informatics, minerals, industrial technologies, engineer, transport, metallurgy, electric welding, energy, and shooter weapons. A special place in the Museum engages the department of History of aviation and cosmonautics after name of outstanding aircraft constructor Igor I. Sikorsky. As the NTUU “KPI”, on territory of which there is the located museum, in the time occupied leading positions in becoming and development of aviation in Ukraine on the whole and in Kyiv in particular, it would be logical to light up these pages of history of aviation more thoroughly.

On September, 30 in 2003 in Kyiv near airport Zhuliany the State Museum of Aviation was solemnly opened. Without regard to the generous amount, presented in it airplanes and helicopters, do not give complete imagination about comprehensive development of aviation in Ukraine, in particular it the so-called „romantic period”. Here complication consists in that original standards of aerotechnics of those times until now, unfortunately, not saved.

According to our information, there are only three places on territory of Ukraine, which are related to beginning of origin of aviation industry of the former Russian Empire in 1910-th years:

1) The former aircraft plant of Anatra (Simferopol, Autonomous Republic of Crimea; now is temporarily occupied by Russian Federation). On territory of it a shoe factory worked in the Soviet period, now various business corporations work which have not a single attitude neither toward sewing of shoe function, nor the more so to the construction of airplanes;

2) The former aircraft workshop by Feodor Tereschenko (Chervone, Zhitomir district);

3) The former automobile and aviation workshops on the territory of NTUU „KPI” (Kyiv).

The automobile and aviatiom workshops in KPI was built in 1916 (Photo 1). In it ordering of military department for the necessities at the front various works were executed: repair of cars, airplanes, and also



Photo 1.

The former aviation and automobile workshops of Kyiv Polytechnic Institute – one of the first aircraft plants on the territory of Ukraine (1916). Photo July 2007.



Photo 2.

Experimental aircraft-fighter “Torpedo” (“Kasyanenko-5”) with speed 170 km/h, which was built in former aviation and automobile workshops of KPI. Photo 1917.



Photo 3.

The State Polytechnic museum at NTUU “KPI”. Department of the History of Aviation and cosmonautics named after Igor I. Sikorsky. Photo on May, 14 in 2008.

production of their separate parts (over 60 propellers of the different systems, wings, machine gun stripper clips). During 1916-1917 in the workshops were built 3 airplanes “Albatross”, experimental aircraft-fighter “Torpedo” (“Kasyanenko-5”) with speed 170 km/h (Photo 2), and

airplane G-VII, with the variable corner of attack (designer by Volodimir P. Grigor'ev). In course of time in workshops it was foreseen to organize a large aircraft plant with the complete cycle of airplanes production (it was planned to produce about 20 airplanes every month). However through the frequent changes of political line-up in the Russian Empire these plans were not carried out, and in August 1919 all property of workshops was taken out by bolshevists.

Very long time an apartment was in neglected state. But in 2007-2008 it was repaired on the means of NTUU "KPI", and the exposition of section of the history of aviation and cosmonautics was considerably complemented and extended. On May, 14 in 2008 on an area before the new department of Museum a memorial to the aircraft designer Igor I. Sikorsky (1889-1972) was unveiled (Photo 3). He studied in KPI in 1907-1911 and during this time constructed and built two types of helicopters and six types of airplanes. It was an original starting ground in his activity – construction of the first in the world multi-engine airplanes-giants and after emigration in the USA actual foundation of helicopters industry of his new motherland. An author of monument is Mykola Oliynik – the deserved sculptor of Ukraine. He is also the author of monuments other prominent designers of aviation and space-rocket technique, which in different time studied in KPI, – Serhiy P. Korolev, Leo V. Lyulyev, Arkhip M. Lyul'ka, Volodimir M. Chelomey. All of them were set in 2007-2011 on the Museum area and create an unique complex.

The update of the exposition of section of history of aviation and cosmonautics allows to extend possibilities of show history of these industries of technique. Considerable room measure – over 500 square metres, unicity of building, location, in place of events allow to pick up thread the atmosphere of time and cause feeling of eyewitness of epoch for visitors.

Since opening of the renewed exposition the Museum was accumulated by certain experience in a report to the audience of glorious pages of history of Ukrainian aviation.

The section of history of aviation is counted by about 500 exhibits. It is aero-engines, details of equipment and model of some types of aircrafts. All of them acquaint with history an origin and developments of genius creations of man in industry of aviation.

From plenty of the archived materials and the special scientific literature were selected interesting information about designers of different types of aircrafts – balloons, sondes, dirigibles, ornithopters, airmobiles, autogyros, gliders, airplanes, helicopters. All of them are almost fully presented in a poster variant (29 placards).

The special attention in them is spared history of "Kyiv school of aircraft building", when in 1910-th years in town were built about 40 types of aircrafts of original construction – more than in any other town of the Russian Empire. Activity of professors and students of the Kyiv Polytechnic Institute of Emperor Alexander II in distribution of ideas of aviation, creation and test of gliders, dirigibles, airplanes and helicopters of native construction separately are described. Among them – aircraft constructors Olexander S. Kudashev, Olexander D. Karpeka, Grigorii P. Adler, brothers Yevhen and Andrii Kasyanenko, Igor I. Sikorsky, Dmitrii P. Grigorovich, Fyodor F. Anders and others. Also activity of one of the first public aviation organizations in Ukraine and in the former Russian Empire – the students Aeronautic group in KPI (1908-1915) and Kyiv society of aeronautics (1909-1915) – are described.

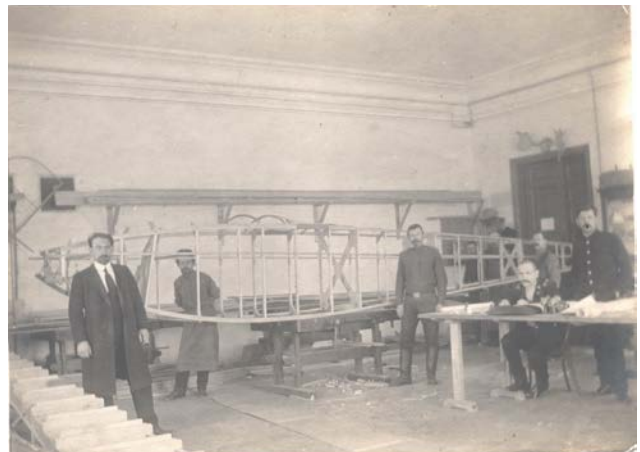


Photo 4.

One of the collector Olexander I. Peresad'ko' pictures. Building in the KPI military airplanes for Russian Empire Army.

Photo 1916.

The pictures of collector Oleksander Peresad'ko, who kindly gave it to the Museum, allow to tell about before the little known page of activity of the automobile and aviation workshops in KPI during the First World War (Photo 4).

The pearls of collection are the model of „Illya Murometc” (large four-engine commercial airliners and heavy military bombing aircraft used during World War I by the Russian Empire Army) and the first native fighter aircraft “S-16”, constructed by Igor I. Sikorsky. All models are reproduced in scales 1:48 and 1:72 and show by itself work of art.

On a becoming of the aviation direction of education in KPI concentrated attention separately. The first attempts to organize an aeronautical department in institute were in 1909. The professor of mechanics Mykola B. Delone took the lead this idea. However, an attempt was unsuccessful due to failing of means and, mainly, barriers from the side of Government, which examined an

aviation in the best case as a separate type of sport, or as a source of potential danger of the existence in general.



Photo 5.

Collection of models of helicopters, which were constructed by Igor I. Sikorsky in USA.

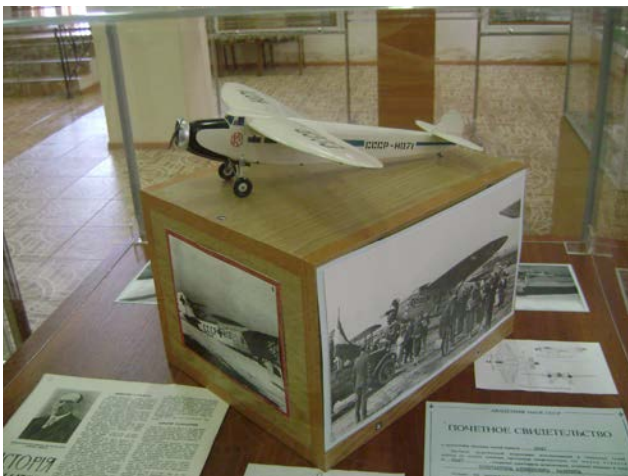


Photo 6.

Model of passenger airplane "K-5", the basic on Soviet internal lines. Aircraft designer – Kostyantyn O. Kalinin, graduated KPI in 1925. Gift to Museum by his daughter Nelli Kalinina in 2005.

In the KPI to this question was returned already in the period of Soviet Power, when on the Mechanical faculty an aerspecialization was inculcated. In Ukraine the first issue of specialists for aviation industry of the USSR took place exactly in KPI on June in 1924. The initiator of preparation of specialists was rector Victoryn F. Bobrov. The graduating students from aerspecialization of KPI in different time were as future aircraft designers as Kostyantyn O. Kalinin, Dmitry L. Tomashevich, Michael K. Skrzhinsky, pilots-testers Olexiy M. Graciansky, Kostyantyn M. Yakovchuk. The aerspecialization of KPI was one of principles of creation here in 1931 Aviation faculty of preparation of aircraft engineers, and afterwards Kyiv aviation institute (now the National Aviation University of Ukraine). Proudly after KPI and its talented students are told in a museum about those, who studied and worked in KPI and in future brought in a considerable contribution to the different areas of science, technique, national

economy of country, created glory Motherland and educational establishment which gave a tour in life. On their example the new generation of students of KPI, future specialists, are educated for the enterprises of Ukraine and many countries of the world.

On May, 13 in 2009 a Government of Ukraine gave out Order № 518-r „About preparation and marking of 120-th anniversary of Igor Sikorsky”. On May, 25 in 2009 within the framework of celebrating this occasion in the State Polytechnic Museum was opened renewed an exposition of the history of aviation, complemented materials, which were given by the son of prominent aircraft designer – Serhiy I. Sikorsky and by an aircraft building company “Sikorsky Aircraft Corporation”, which was founded by his father. Today the aircrafts of brand „S” are used in 26 countries of the world.

To the museum on permanent storage are about 230 exhibits passed. Among them models of helicopters, constructed by Igor I. Sikorsky, their draft, pictures, books, copies of differences of his achievements, including from USA Government (it was on it to age awarded with I. Sikorsky more than 80 differences of USA Government, different backing of development of aviation of America funds). The pearls of collection are 16 models of aircrafts of construction by I. I. Sikorsky: among them „seaplanes” S-38, S-40, S-42, S-44; „aerial cranes” S-60, S-64, S-65; transport „Sea King”, helicopters of maintenance of S-55, landings and sanitary helicopters. All of it considerably will allow to extend the recital of history of native aviation and not limited territorial especially by Ukraine, but bind it to world (Photo 5).

In the Museum a separate block is occupied by placards on which the history of aviation enterprises of Ukraine is presented – the “Antonov” Production Aircraft Plant, Kharkiv State Aviation Plant, The Motor Sich Public Joint Stock Company (Zaporizhia), and also the Designer bureaus of Arkhip M. Lyul’ka and Olexander G. Ivchenko. Work of high-professional specialists, presence of modern technological equipment, allows these enterprises it is advantageous to offer the products in the world aviation market, by an index what exploitation of the Ukrainian airplanes is more than in 120 countries of the World. It must cause for visitors – above all things youths – are sense of pride for our country.

For the visitors of Museum the models of airplanes, which at one time became important landmarks in organization and development of Ukrainian aviation industry, are demonstrated. So, in 2005 daughter of aircraft constructor Kostyantyn O. Kalinin Nelly presented a model of soviet passenger airplane “K-5”, the mass production of which began in 1930-th (all were built about 260 copies with different engines). Before 1940-th years



Photo 7.

Monument to Ukrainian aircraft designer Kostyantyn O. Kalinin (1887-1938), graduated KPI in 1925, who was the founder of passenger aircraft-building in Ukraine. Unveiled on August 28, 2014 in NTUU "KPI"

an airplane was the basic on Soviet internal lines, and used even in the years of Second World war. In general there are not any of models of airplanes of construction of K. Kalinin aviation museum of Ukraine, that's why this gift is very unique (Photo 6). And on August 28, 2014 before the building of Museum a memorial to the aircraft designer Kostyantyn O. Kalinin (1887-1938) was unveiled (Photo 7).

With a break of Ukraine to eight of aviation powers of the World, which have a complete cycle of aviation production, links activity of prominent aircraft constructor Oleg K. Antonov. The models of airplanes of development of his Constructor Bureau are demonstrated in the Museum; among them such as a multiply sky truck of regional lines of "An-38" (it is able to work in the wide range of temperatures from $-50\text{ }^{\circ}\text{C}$ to $+45\text{ }^{\circ}\text{C}$ and is by unique air in the world, exploitation of which is settled to the temperature $-50\text{ }^{\circ}\text{C}$); most in the world serial sky truck after the carrying capacity of An-124 „Ruslan”, turboprop regional passenger airplane of An-140, which is used in the conditions of high mountains, heats and cold climate, on the small air fields even with short flight-landings by bars (in particular and unprepared) with low durability of coverage (in particular ground), sky truck of super large carrying capacity of An-225 „Mriya” (must possibility transport the loads of wide circle of setting) – in all 8 units.

Component parts of airplanes are demonstrated in a museum. So, Ukrainian enterprise The Motor Sich Public Joint Stock Company (Zaporizhia) – one of lead in the world from development, production, repair, and to service of aviation turbo-engines for airplanes and helicopters – yet in beginning of functioning of museum passed to him in a gift the aviation engines of the production: turbojet RU-19-300, fourblade AI-24 (series of



Photo 8.

*New monumental exhibit of Museum – The Yakovlev **Yak-40** (NATO reporting name **Codling**) is a small, three-engined airliner, the world's first regional jet transport aircraft. Prodeded in 1967-1981. Passed to Museum by National Aviation University of Ukraine. Photo September 2012*

V-1) (it is set on the airplanes of An-24, An-30, An-32), first in the USSR a turbojet aero-engine of D-36, with the high degree of two-circuitance, which was set on the passenger airplanes of Yak-42, on the sky trucks of An-72 and An-74 (marked the State bonus of the USSR in 1977) (Photo 8).

The evident standards of aviation equipment, which are demonstrated in a display, is a central pilot board of aviation devices of airplane of AN-24 (developed in the Constructor Bureau of Oleg K. Antonov in 1966), rescue side stores of information of SBN-AK and 6MB-1 (developments of „Elektronprylad”, Kyiv; places of natural calamity of aircraft intended for radiomarking on land and to the water surface for his exposure by the satellite system „KOSPAS” and occasion searching-rescue facilities; carry out a magnetic record the last 30 minutes to flight and can be used on all types of airplanes and helicopters).

Sure, the sizes of apartment do not allow to rotin even an small airplane. But one engineless vehicle is presented in an original size is an educational glider “Junior”, built on the basis of glider of aircraft designer Oleg Antonov “A-1”. Weight of glider makes 110 kg, speed of soaring is evened 110 km/h. Flight of glider is carried out by a rubber cord which carries out the role of catapult. Exactly on gliders the first steps in the submission of sky carry out future pilots (Photo 9).

By the standard of pilotless aviation, presented in a museum, an experimental unmanned aerial vehicle (UAV), which was developed in Club of aerospace creation of „Aviant”. It is used for the exposure of damages of gazo- and oil pipelines, lines of electricity transmissions, radiation and chemical secret service, patrolling of land and marine scopes, exposure of sowing of narcotic plants, delivery of loads, in difficult of access districts and others like that.



Photo 9.

Educational glider "Junior", built on the basis of glider of aircraft designer Oleg Antonov "A-1".

On June, 15 in 2009 the department of History of aviation and cosmonautics was filled up by another new exhibit. On a ground before included in an apartment a soviet small lightly armored transport helicopter The Mi-2 of development of Constructor Bureau Mikhail L. Mil (beginning of 1960-th). This was the gift of The Ministry of Defense of Ukraine. After the reppair works in the airrepair factory in Konotop helicopter Mi-2 was not only got by status an exhibit but also became the original visiting-card of museum in particular and to the university on the whole (Photo 10).

The second component part of department of history of aviation and cosmonautics of State Polytechnic museum is a section, devoted to the history of cosmonautics in Ukraine and in the world. Basis of it was made by collection of museum of veterans of cosmodrome Baikonur. Exhibits were brought from a cosmodrome Baikonur, from Center of preparation of cosmonauts, from the base of storage of space vehicles of Military-space forces of the former USSR. Among unique exhibits there are a trigger vehicle of spaceship series of „Voskhod” (Photo 11), which was in space, trainer complex, which consists of the stand of operator of space-communication, imitators of star sky, and space a sextant which is set in the booth of spaceship, a combustion with the steering engines of rocket-transmitter chamber is „Soyuz”, tail compartment with the engine setting of battle rocket of R-12, standards of space food, copy of the first space satellite (Photo 12).

The Museum cooperates with public organization of veterans of cosmodromes Baikonur, Kapustin Yar, Plesetsk, State Space Agency of Ukraine, Youth aerospace association „Constellation”, and with other organizations. Due to these copulas the display of department of history of cosmonautics is constantly filled up.

One of forms of propaganda of knowledge from history of native science there is a leadthrough on the



Photo 10.

Soviet small, lightly armored transport helicopter The Mil Mi-2 of development of Constructor Bureau Mikhail L. Mil (beginning of 1960-th) near the Museum. Photo 2010.

base of museum of the scientific reading from a cycle “The Outstanding designers of Ukraine”, founded in October, 2001 on initiative of President of National Academy of Sciences of Ukraine academian Borys Ye. Paton, rector of NTUU „KPI” academician Michael Z. Zgurovsky and at support of Scientific advice of university. Reading is conducted 4 times on a year and the maintainances of historical memory have for an object about the distinguished native achievements of scientific and technical and engineer-designer ideas, creation of integral historical picture of development of science in Ukraine, acquaintance of public with prominent native creators – pioneers in different industries of scientific and technical creation, education of student young people, on the examples of high achievements of previous generations of engineers and research workers.

On the whole, on the end of 2015 the Museum conducted 55 scientific readings. Ponderable part them were devoted, in particular, and to the prominent creators of aviation and space-rocket technique: to Michael Delone – the professor-mechanic, to the propagandist of ideas of gliding and aviation, Kyiv politechics – pioneers of aviation (Oleksander Kudashev, brothers Andrii, Yevhen and Ivan Kasyanenko, Fheodor Tereschenko, Volodimir Grigor’ev, Fheodor Anders, Georhiy Adler, Olexander Karpeka), to the scientist in industry of aircraft building, to one of organizers of Ukrainian aviation industry Victoryn Bobrov, to the aircraft designers Igor Sikorsky, Kostyantyn Kalinin, Olexander Mikulin, Oleg Antonov, Dmitry Grigorovich, to the designer of aviation engines Arkhip Lyul’ka, to the designer of anti-aircraft rockets Leo Lyulyev, to the designers of the space system engineering of Serhiy Korolev, Volodimir Chelomey, Valentin Glushko, Gleb Lozino-Lozinskiy, Mikhail Yangel. With lectures on these readings graduate students and academicians, cosmonauts, come forward and museumians. Public associations take part in reading even, for example Advice



Photo 11.

A trigger vehicle of spaceship series of „Voskhod”.



Photo 12.

A tail compartment with the engine setting of battle rocket of R-12.

of veterans of space centers Baikonur, Kapustin Yar and Plesetsk. Members of separation are „Researcher” of the Small academy of sciences undertake the first steps in science, publishing results it researches in materials of the scientific reading. Presently it went out from a seal already fourth first volumes of book the „Outstanding designers of Ukraine”. All of them contain enormous bibliography and accompanied pictures.

These scientific readings are conducted above all things for young people. Exactly they can be instrumental in creation of integral historical picture of development of science in Ukraine, to its role and value as a substantial element of constituent of world progress. Exactly in our time to enable to feel respect and pride for the predecessors the five thousands – students of KPI – our audience – young citizens of Ukraine, – is very important.

Important direction of activity is popularization of museum in Mass-Media: newspapers, magazines, television and radio programs. In a number of magazines there were the printed interviews and articles about a museum, the employees of museum co-operate with the journalists of radio and television, the informative prepare and news subjects with a story and demonstration of display of museum.

Due to the update of display the State Polytechnic Museum got new possibilities for expansion of the activity. History of development of aircraft building and cosmonautics of Ukraine is to the audience by the leadthrough of excursions, reading of lectures, organization of meetings with the veterans of aviation and cosmonautics, establishing connections with the museums of history of aviation and cosmonautics of Ukraine and other states, addition to the display, edition of literature, booklets, and others. The students of the first cours of NTUU “KPI” are seeing a museum without fail.

Today the Museum is a social institute of maintainance, presentation and translation of historical,

cultural, technical and natural legacy of Ukraine. Oriented on this determination, the main aim of the State Polytechnic Museum of Ukraine is bringing in to work of all social levels of Ukrainian society, which, as we hope, this article will be promote.

This article is composed on the materials of:

Татарчук В. В. Відображення історії авіації України в експозиції Державного політехнічного музею при НТУУ “КПІ” як складова частина підготовки майбутніх інженерів-авіабудівників / В. В. Татарчук // Університетські музеї: європейський досвід та українська практика: Збірка праць Міжнародної науково-практичної конференції (6-7 жовтня 2011 р., м. Київ) / Упор. Л. В. Казанцева. – Ніжин: Вид-во НДУ імені Миколи Гоголя, 2012. – С. 361-372.



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