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AVIATION EDUCATION ON MILITARY UNIVERSITY OF TECHNOLOGY, WARSAW

INTRODUCTION

The Military University of Technology (MUT) is the largest military polytechnic in Poland. The University has been shaped by the creative efforts of its excellent university teachers and research workers. In the University, the first lasers in Poland were designed in 1960; and then, pioneer work was conducted in respect of its military and civilian applications.
Nowadays, modern technologies are also being developed, especially those, which influence directly the methods of military equipment design and production and also those that contribute meaningfully to the advancement of science. The MUT currently conducting teaching and training in over 30 areas of technology at different levels: at the BSc level, MSc, postgraduate, and PhD level. The University is authorized to confer DSc degrees in 7 disciplines, and PhD in 9. Parallel to this, we conduct our own research work, which involves about 40% of the University's intellectual potential. In the light of participation in NATO and future accession to the European Community, MUT adapts its structure and functioning to the rapidly changing economy and educational challenges. Therefore, it is in process of transformation into modern, civilian-military university of technology.

FACULTY OF ARMAMENT AND AVIATION TECHNOLOGY

The Faculty of Armament and Aviation Technology was established as a result of modernisation of Polish Armed Forces, mainly as a consequence of introducing of a military rocket technology in the late fifties. The faculty started its scientific and didactic activities in 1961 under the name of Faculty of Rocket Armament. Up to 1994 the name was changed twice. In 1990 the Institute of Aviation Technology was incorporated into the structure of the faculty. The institute was transferred from the Faculty of Mechanics. In 1994 the Faculty of Electromechanics was converted into a Faculty of Armament and Aviation Technology with a new structure. Now the faculty comprises:

— Institute of Aviation Technology;
— Institute of Rocket Technology;
— Institute of Armament Technology.

AVIATION EDUCATION ON THE IAT

The Faculty of Armament and Aviation Technology (FAAT) of the MUT especially its Institute of Aviation Technology (IAT) is responsible for training of the ground (servicing) personnel for aviation of all military services i.e. Air Force, Navy and Army Aviation. The graduates of the MUT are in charge of maintenance and service all the fixed and rotary aircraft in operation of the Polish Armed Forces (PAF).
Due to fact that a modern aircraft, missile and rocket are very complex structures, since 1998 faculty has launched a new study domain called mechatronics. Simultaneously a new flexible model of study was introduced by all the university faculties (see Fig.1). The latter, as a result of adjustment of the MUT to civil standards.

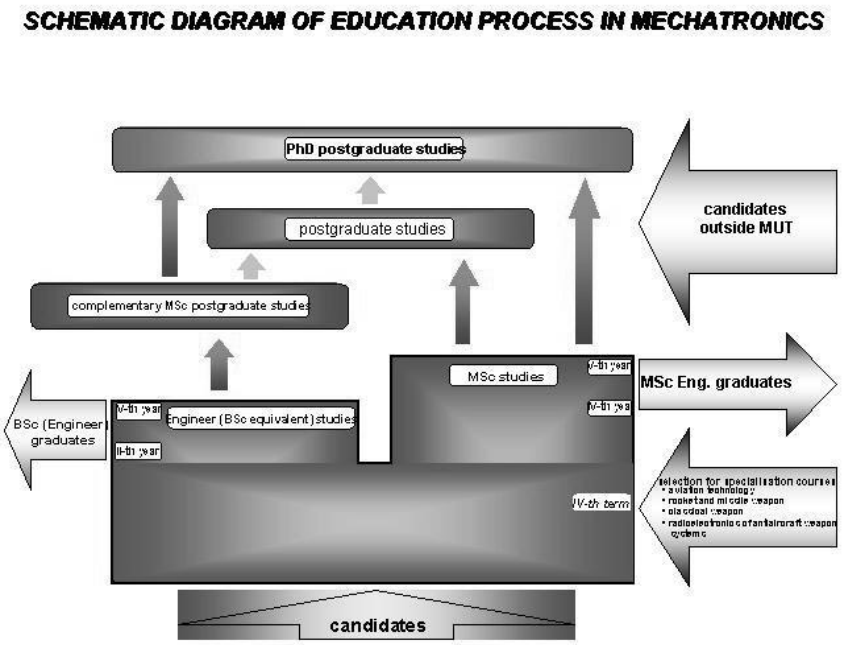

Fig.1. Flexible, three level model of study in the Military University of Technology

In consequence, new courses, including their curriculum were accepted by the Department of Defence and the Ministry of Education as well as international standards and requirements were met, such as: FEANI and ECTS. Nowadays, the Institute offers a three level flexible system of study in the field of aviation engineering: 4-year undergraduate program leading to a BSc degree, 5-year graduate program leading to the degree of a MSc as well as postgraduate program leading to PhD degree.

The essential feature of the present model of the university education is fact, that the first and second year of both undergraduate and graduate programs (provided by the faculty) are common independently from further specialisation and profiles (conduced subsequently by three institutes of the faculty). After completion of the second year of mechatronics, students who want to obtain aviation degree begin specialisation in aviation engineering and simultaneously a profile of the specialisation is selected. Recently following courses (called profiles) on aviation engineering are available at the Institute of Aviation Technology.

For cadets (military students) profiles:

- Airframe and Propulsion System;
- Aviation Armament;
- Avionics;

optionally for the PAF requirements the two following courses can be launched:

- Aircraft Emergency Escaping System;
- Navigation and Onboard Weapon Control System.

In the light of changes in country and due to fact that the MUT education system has got a full acceptance of Ministry of Education, university, including our faculty has been opened for civil students and some courses are available for them. Recently institute has launched part time and correspondence courses for civilian:

- Aviation Engineering (Airframe and Propulsion System, Avionics);
- Designing Manufacturing and Maintenance of the Mechatronics Systems.

However, the present names of profiles reflect the formers specialisation on mechanics and mechanical engineering lines (former lines of the faculty), their curriculum were deeply changed and fitted to a new requirement of modern aviation technology. We came up to a conclusion, that the modern aviation technology requires a new type engineer, who could be provided with substantial knowledge in the field of: mechanics, electronics, and informatics. Therefore the macro line mechatronics seems to be the satisfactory solution for our students, further maintenance managers or aviation designers. As a result of this assumption new subjects appeared in the mechatronics curricula, such as: marketing and organisation, systems theory, quality management, engineering graphics, CAD/CAM systems, mechatronics, microelectronics, diagnostics etc.

In that way CAD/CAM software and modern plotters replaced a conventional calculator and a drafting board. New courses, within mechatronics line, required not only modification of their curriculum but also modernisation of the laboratories and didactic stands. Almost all the classrooms were modernized, and new workshops were opened. One of the remarkable didactic laboratories is the aviation squadron (flight unit), military installation (an integrated part of institute), equipped with all aircraft in service of the PAF and logistic equipment, such as: hangar, apron, and ground auxiliary system. Aircraft and proper logistic base allow for on job training of students. Moreover, during the summer break our students spend a month at professional training in selected aviation companies, military aircraft works, military aviation units etc.
Poland is a member of NATO treaty, satisfactory English language skill is one of the university objectives, so students complete 480 hours second level (according to STANAG 6001) English course.

RESEARCH ON THE IAT

The academic staff carries out both fundamental and applied researches in mechanics, electronics, utilization and maintenance. The university personnel undertake research projects commissioned by both the Polish Armed Forces and military industry. The didactic and research base of the Institute is composed of 8 laboratories:

- Aerodynamics Laboratory;
- Aircraft Structure Laboratory;
- Thermodynamics Laboratory;
- Propulsion System Laboratory;
- Avionics Laboratory;
- Automatics Laboratory;
- Aviation Armament Laboratory;
- Aircraft Maintenance Laboratory

and mentioned above aviation squadron (flight unit) for on job training.
The laboratories are equipped with unique research stands and instruments, which enables performing measurements and experiments of several types in both laboratory and real conditions. Among many research and didactic installations worth specifying are:

- a subsonic wind tunnel of a 1.1 m in diameter measuring chamber with capabilities of reducing environment temperature up to minus 10 centigrade;
- a supersonic (3.5 Ma limited) wind tunnel of a 0.3 m in diameter measuring chamber;

— models of aircraft in service of the Polish Air Force for tunnel investigations:
  - a 1:20 scale model of the MiG-29;
  - a 1:25 scale model of the Su-22;
  - a 1:30 half model of the MiG-29;
  - a 1:1,25 model of a wing of the Su-22;
  - two models of a ejection seats in scale 1:2 and 1:3 respectively.
— three strength-testing machines;
— laboratory stands for the investigation of the thermal conductivity of insulating materials and the thermal difftisivity of solids, an interferometric dilatometer for a wide temperature range high thermal resolution investigations of the linear thermal expansivity of solids, a differential scanning calorimeter Pyris 1 (Perkin Elmer);
— a computer aided system of a guided missiles maintenance;
— a simulator of an on-board aircraft diagnostic system;
— 2-D and 3-D computer aided design systems (CAD) and a Unigraphics system for constructions modelling.

Nowadays the IAT employs 10 university professors (including 5 full professors), 18 doctors (with PhD degree) and 10 assistants. The Institute cooperates with civilian research canters. The Institute of Aviation Technology carries out researches in the following main domains:

— subsonic and circumsonic wind tunnel investigations of the aircraft elements;
— flying object moving investigations and the flight computer simulation for different type of flight disturbances;
— numerical calculations of a strength of aviation constructions in static and dynamic range;
— free vibration and flutter investigation for different aviation constructions;
— computer simulation investigations of flight control systems and on-board diagnostic systems;
— thermal-flow computations of aircraft engines and turbine power plants diagnostics;
— thermophysical properties investigations;
— studies on aircraft maintenance;
— studies on air-rocket systems and their optimum operation and maintenance;
— probability models of fatigue cracking expansion with implementation to the aircraft construction elements;
— identification of dynamics of mechatronics objects;
— evaluation of safety conditions for emergency ejection seats;
— gluing technology applied to the aircraft constructions;
— aircraft hydraulic systems and elements investigations;

— aircraft effectiveness evaluation of armament systems;
— design of a computer aided system of guided missile maintenance;
— on-board diagnostic system simulator design.

The Institute scientific and didactic staff is familiar with the latest achievement in the aviation technology. We take part in the world wide international aviation affairs (Farnborough International, Le Bourget Paris and ILA Berlin) and we actively participate in many respectable international congresses and seminars, such as: ICAS Congress, European Rotorcraft Forum and NATO-SCI/RTO. We participate in organisation of a few domestic and international conferences such as: „Avionics", „Mechanics in Aviation" and „Science Aspect of Armament Technology".

Fig. 2. The subsonic wind tunnel with capabilities of environment temperature reduction up to minus 10 centigrade.

REFERENCES

[1] Military University of Technology, Warsaw http://www.wat.waw.pl/,
[2] Faculty of Armament and Aviation Technology of the MUT http://www.wul.wat.waw.pl/