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PERSPECTIVES ON AVATION TRAINING  
IN POLISH UNIVERSITIESPERSPEKTYWY POLSKICH UCZELNI  
W ZAKRESIE KSZTAŁCENIA NA RZECZ  
TRANSPORTU LOTNICZEGO

## Abstract

This article presents the potential for development of aviation education at Polish Universities with a focus on aircraft mechanics training certified by the Civil Aviation Authority in Warsaw and the European Aviation Safety Agency (EASA). An engineering graduate who obtains such a licence in addition to having a diploma would have no problems with finding a suitable employment.

*Keywords: aviation training, aircraft engineering, polytechnic education*

## Streszczenie

W artykule przedstawiono potencjalne możliwości rozwoju kształcenia lotniczego na polskich uczelniach, z naciskiem na szkolenie mechaników lotniczych certyfikowanych przez Urząd Lotnictwa Cywilnego w Warszawie oraz Europejską Agencję Bezpieczeństwa Lotnictwa EASA. Absolwent studiów inżynierskich, który obok dyplomu, miałby tego rodzaju licencje, nie powinien mieć problemów ze znalezieniem dobrej pracy.

*Słowa kluczowe: szkolenie lotnicze, inżynieria lotnicza, kształcenie politechniczne*

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## 1. Introduction

As is clear from the practice of recent decades in the labour market, the greatest demand is for technical experts in various fields. On the other hand, graduates of secondary and higher technical schools, often complain about the lack of work or lack of adequately paid employment – they tend to work below their level of education, often abroad. In the nineteen-nineties, many technical secondary schools were closed in Poland. One of the areas where technicians are still needed is aeronautics.

In the politics of the European Union, regional development is highly prized. These ‘little homelands’ are very diverse in terms of development and living standards. A key factor in determining the degree of alignment between developed and less developed regions is investment in infrastructure, logistics, transport and its sub categories including air transport. One of such branches is air transport. In this respect, Poland unfortunately still lags behind Western countries where aviation is commonly used. Unfortunately, in Poland, where the process of economic change is still ongoing, air transport is still limited; however, some developments in this field can be seen in Poland.

This concerns not only the airlines, but also General Aviation (GA) – light transport and air services performed without permanent schedule, usually by light aircraft. The concept of general aviation has not yet been clearly defined – it includes light recreational and business aircraft fleet., which perform non-scheduled flights that are, as a rule, usually non-commercial. This definition is not complete because GA also often includes heavy private planes (eg. Business jet Boeing 737BBJ), gliders and ultralight aircraft (including trikes/microlight aircraft). In other words, general aviation refers to a wide variety of aircraft usually carrying from 2 to 15 persons, a small load (up to several tons) and used to patrol forested areas and roads, or for medical or postal services etc. Interestingly, GA accounts for about 90% of civil aviation in terms of the number of aircraft and the number of flight operations [1]. The remaining 10% is made up of aviation transport – airlines. This, however, relates to the number of flights and not the number of passengers or volume of cargo. Most passengers are carried by traditional aviation carrying not just a few passengers but a few hundred.

This article provides a general description of the proposed vision of a modern aviation school, providing staff for both general aviation and communication, and to some extent, also for the military. This may be for a technical high school, a component of higher university education (e.g. BSc) or vocational training. The mission of such a school should be to produce highly qualified middle and senior technical personnel for industry, military, general aviation and air transport.

In recent years the European labour market, has suffered from a lack of qualified aircraft mechanics [3]. This is also true in Poland, where trained aviation technical school graduates, or those who have an engineering degree with a licence in aircraft mechanics are almost guaranteed a good job. Unfortunately, there is no such school in western Poland, yet. A modern aviation centre of learning could be created as an aviation mechanical technical works or university offering a degree in engineering, logistics and transport.

A requirement of the job market nowadays, however, is that such school certificates are issued by the Civil Aviation Authority in Warsaw and the European Aviation Safety Agency EASA, so that graduates can obtain national and international (EU) aircraft mechanics

licences. Possessing a technician or engineering diploma at university is often considered insufficient by present standards and must be supported by obtaining the EASA licence. This could be overcome by cooperation with another aviation training centre or MTO – Mechanic Training Organisation (MTO), which can confer such certification.

For example, the centre in Mielec, MTO Royal Star is willing to work with schools and is even prepared to apply for EU grants for this purpose. In this way, the graduate would receive professional training in elite professions which are in demand on the labour market, as well as the knowledge required to undertake further technical studies (especially on the aviation profile). Ultimately, the school can later obtain all certificates and begin conducting their own training without the need for participation from external organizations.

Table 1

**The types of international aircraft mechanic licenses [9]**

Categories of 'maintenance' licenses according to Part-66	Type of certified operation
A Line Maintenance Certifying Mechanic	Simple, scheduled line maintenance and rectifying basic faults within the limits of the tasks specified in the mandate. Work done in person at the Part-145 organisation
B1 Maintenance Certifying Technician – Mechanical	Technical support of aircraft structure, powerplant and mechanical and electrical systems, as well as replacement of blocks within avionics line maintenance, requiring simple tests to verify the correctness of the blocks' actions Category B1 shall automatically include the appropriate A subcategory
B2 Maintenance Certifying Technician – Avionic	Technical support for avionics and electrical systems (certifies a simple, scheduled line maintenance – possible if possessing a category 'A' licence
C Base Maintenance Certifying Engineer	The base (hangar) maintenance of whole aircraft in the organisation Part-145

The biggest problem in organising technical courses may be attracting teaching staff and organising basic practical training classes. There would be a requirement for supply of technical staff and teachers from outside, as well as the purchase of new literature for the library. The best solution would be to work with polytechnics and possibly other schools and universities. The practical part of the course could take place outside the school, in airports or in other educational centres. Professional practices should be conducted only in centres with modern technology and aircraft engaged in training technical staff – to achieve this end, schools could collaborate with technical training centres listed with the Civil Aviation Authority.

An aviation mechanic is a highly skilled person, authorised to certify activities performed on aircraft that comply with applicable European Standards Part-66 (European legislation on aviation technical staff certifying the operation of aircraft).

Under the law, a person under training in this profession can gain the necessary knowledge through the following routes:

- high school or university;
- learning in aviation training centre MTO;
- studying at a Part-147 training organisation;
- self-study (supported by state exams).

Currently, there are legal opportunities for trainee aircraft mechanics to obtain Polish and European licensed aircraft mechanic certification through a curriculum in secondary or higher technical school. The provision regulating this issue can be found in Poland as the Report Recognition of Knowledge (appendix to regulation No. 15 of the President of the Civil Aviation Authority dated 30/11/2007). In Poland, this document is known as the RUW (Raport Uznania Wiedzy) [5].

During the preparation of the above-mentioned document, an analysis approved by the Ministry of Education core curricula of teaching in schools and curricula provided by universities. The RUW has proven itself in practice, as evidenced at schools that have already received related accreditation.

Table 2

**Examples of courses (modules) for obtaining the aviation mechanics licence which may be classified under evaluation of technical school in conjunction with the RUW [5, 9]**

No.	Name of course (module)
1	Maths
2	Physics
3	Electrotechnics
4	Electronics
5	Digital techniques
6	Hardware
7	Aviation equipment maintenance
8	Basic Aerodynamics
9	Human factors in aircraft maintenance
10	Aviation regulations
11	Aerodynamics, structure and systems of planes (A1, A2, B1.1, B1.2)
12	Aerodynamics, structure and systems for helicopters (A3, A4, B1.3, B1.4)
13	Aerodynamics, structure and systems of aircraft (B2 only)
14	Aviation powerplant (B2 only)
15	Aviation turbine engines (A1, A3, B1.1, B1.3)
16	Aviation piston engines (A2, A4, B1.2, B1.4)
17	Propellers (A1, A2, B1.1, B1.2)



Fig. 1. Design of the PWSZ university at Chelm with hangars and aviation laboratories [10]

Looking into the future, schools could become major centres for comprehensive training for aviation and not only in mechanical contexts. Aviation is not only about pilots and technicians – safety in aviation also relies upon other specialists, e.g. controllers, dispatchers, managers and logisticians.

Today, many wonder whether it makes sense, whether technical or engineering studies about the profile of mechanical and aerospace have a *raison d'être* in the current market? The author of this paper thinks they do, as evidenced by examples of new flight schools in Poland, which prosper – one of these is the European Aviation Technical College (Europejskie Technikum Lotnicze ETL) at Powodowo (Wielkopolska province), which was created from scratch over the last decade. The school is dynamically developing and has its own sport aerodrome recently built from scratch.

An example of a university for this profile was founded in the early twenty-first century, this is The State Higher Vocational School in Chelm, where degrees in aeronautical engineering and piloting can be obtained. The school was built from scratch and even includes its own airport in Deputycze Królewskie. The website of PWSZ-Chelm reads: “From the moment of registration, flight training for students of mechanics and mechanical engineering is continuously carried out, there are trained aeroplane pilots, helicopter pilots and also aviation mechanics. The airport plays an important role in the region, in addition to the training activities carried out there, public order agencies and aviation enthusiasts enjoy it”.

Today’s modern society must be based on knowledge. The famous expression ‘learning for life’ implies continuous development, not only of students, but also teachers. To achieve this, it is important to ensure that school staff have easy access to courses and postgraduate improvement. It is worth noting especially that postgraduate studies funded by the EU (European Social Fund). The school could theoretically help students to obtain the following certification for the pilot:

- Private pilot licence PPL (A),
- Professional pilot licence CPL (A).

A large part of the knowledge required to obtain a pilot’s licence coincides with the curriculum on technical studies in university.

A school should seek the broadest possible ways to obtain external funding (national and EU programs/ESF) for the development of schools and educational projects. For example, several schools in Poland have already obtained the funding to equip a computer lab for flight training. The introduction of technology-based learning and e-learning may be extremely useful – this is a specific embodiment of the training method in absentia through extensive use of online technology.

## **2. The potential implementation and development of aeronautical engineering at Polish technical universities**

Aviation technology and mechanics can be one of the very attractive faculties for studying in modern Europe. The student would attend classes in fields of both design and aircraft operation. Training in the operation, in addition to the engineering program, could include software modules provided for the licensed aircraft mechanic category A or B.

In addition, each of the fields of engineering and aviation should also include a module of general knowledge in the field of aviation. The author proposes that it should consist of the following items:

- air traffic management (perhaps using a computer air traffic control simulator);
- geography and air navigation;
- principles of aeronautical radio communication (phraseology, methods of maintaining communication);
- construction of aircraft;
- construction of radar and radio navigational equipment;
- aviation flight instruments;
- basic knowledge about piloting aircraft (including use of computerised flight simulators);
- international aviation and airlines;
- Air Force;
- aviation law and flight rules;
- human factors in aviation and aero medical grounds;
- the history of aviation.

At the end of this paper, the author has added some digressions on contemporary engineer-graduate technical studies. We are often unsure about who should be an engineer. Once, in the communist era, Poland had a producer market and almost everything that was produced could be sold. This has forged with us the false notion that a task for an engineer is to build something that just needs to work well, and questions regarding the need for such a product are deposited on the back burner. Meanwhile, the product, in addition to having to work, must also be able to sell. Which is why all producers need to execute thorough market research and consumer needs assessments, concepts which are already in the field, and not only in scientific disciplines and sometimes can reach beyond science. It is impossible to compute what the recipients will need mathematically. For example, we can consider the Polish historical case of the PZL M-26 Iskierka trainer aircraft (known also as Airwolf) which was designed on the basis of the Piper PA-34 Seneca. As a technical object, she acted flawlessly,



this aircraft was safe and pleasant to fly, but almost no one bought it. The M-26 proved to be too light for the army (the armies of the world prefer to train in heavier aircraft, of the PZL-130 Orlik or PC-9 Tucano class) and it was too heavy for civilian flying clubs (the cost of flying hours on the M-26 would be much higher than the Cessna and Piper aircraft used for training). Besides, for civilian pilot training, it is preferable for the trainee and the instructor to be sitting next to each other rather than one in front of the other as is the case with the M-26.



Fig. 2. Beechcraft Starship – very modern aircraft, but its vanguard design probably discouraged many potential customers [7]

The failure of the M-26 project lies largely in a failure by the producer of that aircraft to correctly qualify market demand. When it comes to foreign manufacturers, an interesting example is the American Beechcraft Starship aircraft. Despite its modern design and good performance, this aircraft also lacked buyers. In this case, the vanguard silhouette with a canard presumably discouraged customers. Although this layout can enhance performance (both wings and stabilizers produce lift), it is quite different from traditional aircraft. Potential buyers prefer to buy something known and proven, rather than risk investment in new vanguard designs.

Within three years of certification, only eleven examples of the Starship aircraft were sold. The low sales were caused by the economic slowdown of the late eighties and the careful approach of customers to technical innovations (of which the Starship was undoubtedly one) and the high tax on luxury goods which was in force then in the United States. In 2003, the Beechcraft producer announced that it would not maintain technical support for such a small fleet of Starship aircraft, and started scrapping aircraft owned by the factory. The manufacturer failed to adequately characterise the market before commencing work on this vanguard design, though the Starship itself was technically well built and flew properly.

As is clear, engineering today cannot be based only on maths, it must also take into account variables determined by many other factors, the hooking of sociology, psychology, issues of fashion, as well as the usual intuitions [6, 4].



Fig. 3. The PZL M-26 Iskierka (Airwolf) trainer aircraft [8]

A Polish lecturer at the famous Massachusetts Institute of Technology (MIT), a specialist in complex mathematical calculations, Prof. Eng. Arch. Waław Zalewski, designer, among others of the 'Spodek' building in Katowice, says outright that in Poland, engineering puts too much emphasis on strict thinking (based mainly on maths), rather than teaching independent thinking and creativity. He explains [6]: "sketching for me has always been more important than the calculation (...). Such work can be performed by computer. But your computer can not create the design of Spodek (...). The engineer makes decisions that are approximate (...). Therefore, you must use intuition, and this is not a scientific concept".

### 3. Summary

The modern education of flight engineers must flexibly respond to the needs of the labour. It is therefore proposed here to the program of studies included both part of the construction of aircraft, as well as modules for their maintenance (training for licensed mechanic) demands of the potential recipients of our services (customers) should be the main determinant of changes in the education process. This also applies to the construction and design of academic courses where students are taught to realise that the implementation appropriate theme for activities ought to go beyond traditional engineering.



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