The participation of romanian universities at the partnership “PEGASUS” - a chance for the aerospace higher education in Romania

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Abstract: The consolidation process of the European Aerospace Industry has implied a continuous process of cooperation and mergers during the last decades, initially within the national borders, but now increasingly across these borders. Working in an international team, with linguistic diversification and other cultural differences, will require a global mind setting which goes beyond a mere technical education. In the framework of the educational reform within the European Union initiatives have been taken with the objective to harmonize the educational systems of the different countries and to introduce new international oriented study curricula based on two main study cycles. The objective of this paper is to present the Partnership of an European Group of Aeronautics and Space Universities (PEGASUS) - a chance for the aerospace higher education in Romania.

Key Words: Aerospace, Education

1. INTRODUCTION

The ongoing opening of the education market across the national borders required new study structures in the higher education across Europe. In order to strengthen the educational internationalisation numerous bilateral cooperation programs and university networks have been developed. Considering the European dimension of engineering education, however, it has to be seen that graduates are differently prepared for industry, depending on the university they got their degree. The European educational institutions will have to face the competition among graduates within Europe and beyond.

To obtain an international acceptance, the various educational programs should meet a certain standard of quality. In order to cope with these new requirements, the system of higher education has been restructured in most of the European countries.

The basic approach of this restructuring process has been the harmonization of the aerospace engineering curricula on the one side and the endeavour to intensify the cooperation, in particular in developing common teaching programs, as well as to increase the exchange of students between different universities on the other side [1]-[2].

2. THE BOLOGNA CONVENTION AND THE COMMON LANGUAGE OF RECOGNITION

On the occasion of the 800th anniversary of the Sorbonne, on 25 May 1998 the Ministers of Education of France, Germany, Italy and the United Kingdom signed a special declaration
for setting up a European frame for higher education that would match and support the new requirements. To make the rather complex European higher education systems more transparent, to increase compatibility between programs and certificates and even to promote a degree of consistency, a follow up meeting took place in Bologna (June 1999) where the Ministers of Education of all 15 EU member states as well as 14 non-EU member states signed the so called “Bologna Declaration” [3].

The following six objectives have been defined in Bologna:

- Adoption of a system of easily readable and comparable degrees (Bachelor, Masters’), including large-scale introduction of a Diploma Supplement;
- Adoption of a system essentially based on two main cycles;
- Adoption of a credit system similar to the ECTS (European Credit Transfer and Accumulation System), which facilitates the transfer and accumulation of study credits;
- Promotion of the mobility of university students, researchers and administrative staff, and the removal of all obstacles to the free movement of students;
- Promotion of cooperation in quality assurance;
- Promotion of the European dimensions in higher education, particular with regards to the development of common curricula, cooperation between institutions of higher education, integrated study programs and research projects.

On 29-30 March 2001, in Salamanca, over 300 European higher education institutions reaffirmed their support to the principles of the Bologna Declaration and their commitment to the creation of the European higher education area [4].

One of the most important results of the Bologna Declaration were a series of national reforms resulting in moving towards shorter studies, introduction of first degrees in systems where they were unknown, introduction of 3 years bachelor and 2 years master degrees (often designated as “3+2 year system”) instead of or parallel to long, “tunnel-type” curricula which offer no successful exit point before 5 or more years of study. Most of the countries have already started to introduce the new systems, as this is the case e. g. for Germany and Italy. In particular in the aerospace education the advantages of the new curricula are evident. They give students better chances on the international market, and encourage students to study abroad if they know their degree will be accepted at the home country.

One of the major barriers for an inter-university exchange is that national records may not be recognised abroad. To improve access to information on foreign curricula and to provide common procedures for academic recognition, the European Credit Transfer and Accumulation System (ECTS) [5] has been introduced by the European Commission more than 18 years ago. ECTS was initially established under the Erasmus program (1988-1995).

ECTS credits are a value allocated to course units to describe the student’s workload. They are a measure for the quantity of work each course requires in relation to the total quantity of work required to complete a full year of academic study including preparation for exams. In ECTS, 60 credits represent one year of study in terms of workload, 30 credits six months (a semester) and 20 credits a trimester respectively.

3. PEGASUS NETWORK

As a consequence of the intensive restructuring process in industry and in particular the globalization of the market, the major universities involved in the aerospace education reacted to the need to make the aerospace education more transparent to companies within Europe.
LIST OF THE 23 PEGASUS MEMBERS (2009):

**CZECH REPUBLIC (1)**: České Vysoké Učení Technické v Praze (CVUT), Praha

**FRANCE (3)**: Groupe des Ecoles Aéronautiques et Spatiales (GEA): ENAC, ENSMA, ISAE

**GERMANY (6)**: RWTH Aachen, TU Berlin, TU Braunschweig, Universität Stuttgart, TU München, TU Dresden

**ITALY (5)**: Politecnico di Milano, Politecnico di Torino, Università di Pisa, Università degli Studi di Roma (La Sapienza), Università di Napoli

**THE NETHERLANDS (1)**: TU Delft

**PORTUGAL (1)**: Instituto Superior Tecnico (IST), Lisboa

**SPAIN (2)**: Universidad Politécnica de Madrid (UPM) / ETSIA Universidad de Sevilla / ESI

**SWEDEN (1)**: Kungl Tekniska Högskolan (KTH), Stockholm

**UNITED KINGDOM (3)**: University of Bristol, Cranfield University, University of Glasgow

The PEGASUS network of European aerospace universities was founded in 1998 at Toulouse, and has been formed from an initiative taken by the four main French Grandes Ecoles involved in aerospace. The initial founding members group was deliberately limited to 20 universities from 8 European countries so that the first required analysis of aerospace engineering education could be done efficiently. In a second phase, PEGASUS has begun to open its membership to more aerospace universities, the admission being granted based upon a set of admission criteria established by the 10th PEGASUS Council meeting held in Delft in March 2003.

The general objective of PEGASUS is to optimize the services that its member institutions offer in the best interests of Europe both in terms of continuing to attract the best students and also to offer highly relevant educational and research programmes.

The members of PEGASUS have collaborated for years in an ad-hoc manner (largely supported by EU funding through the ERASMUS programme) but now wish to work more closely together in a manner that better satisfies the needs of their students and their employers across Europe. Today more than 2500 aeronautical engineers graduate from the member institutions of PEGASUS each year.

PEGASUS members must ensure that together they offer a range of high quality and efficient programmes of support including:

- Degree-awarding programmes
- Continuing Education
- Research
- International cooperation

During the spring 2008 meeting in Prague, PEGASUS decided to create a PEGASUS Business Club that should become a forum for structured and regular interaction between the PEGASUS academic members and the European industry. It was also decided to further open the PEGASUS network to new academic partners who may not be eligible for full PEGASUS membership by creating a new status of Associate Partner. This new status will allow non-EU aerospace universities with high quality standards to partner and take part to specific activities with the PEGASUS network. Associate Partners are Russia (Kazan State Technical University) and Ukraine (Kharkov Aviation Institute).

The PEGASUS Network main organisational bodies are: the Council, the Board, the Chairman, supported by the Permanent Secretariat, and the Working Groups (WGs).
Council and the Board are permanent bodies, the Chairman is elected on a rotating basis, and the Working Groups are non-permanent bodies, being modified according to the actual needs.

**PEGASUS ADMISSION CRITERIA**

The candidate should meet the following criteria:

**A. GENERAL**
1. Be a public and/or non-profit institution of higher education in aeronautical / aerospace engineering
2. Have its main base of operations in a EU country
3. Demonstrate the willingness to sign the PEGASUS Charter and to actively commit to the PEGASUS network activities including working groups

**B. EXCELLENCE**
4. Have a good (national and international) reputation and quality recognition (e.g. national accreditation by an official body) in education and research
5. Deliver one or several degrees in aeronautical / aerospace engineering in compliance with the European Bologna orientation (LMD, +5 level or M for Aerospace Engineering or higher)
6. The main curriculum in aeronautical / aerospace engineering should comprise a sufficient base in Fundamental Sciences (minimum 15%), General Courses including foreign languages, and Engineering Sciences (minimum 40%) of which at least 50% should be Aeronautical / Aerospace Engineering Sciences (that is: minimum 20% of the overall program, or 60 ECTS for a 5-year programme)
7. Have or plan to reach a sufficient volume of activity in terms of student output: 30 graduates per year at the +5 level or higher in Aeronautical / Aerospace should be considered as the minimum target volume
8. (supporting, non-mandatory criterion) Produce a record of first employment of the graduates in industry over the last 3 years, showing the relevance of the engineering programme for the aerospace industry

**C. INTERNATIONAL COOPERATION**
9. Produce a list of active partnership agreements with aeronautical / aerospace faculties or departments of foreign partner universities recognised at the international level, including at least 3 members of the PEGASUS network from at least 2 different countries
10. Produce a record of student and faculty exchanges with foreign universities over the last 3 Years
11. (supporting, non-mandatory criterion) Produce a record of research activities involving international partnership.

**PEGASUS ADMISSION PROCEDURE**

The candidate should write a letter to the PEGASUS Chairman asking for admission and detailing its motivations as well as the benefit of his candidacy for the PEGASUS network. After successful completion of the admission procedure and formal acceptance of the new entrant by the PEGASUS Council, the new entrant is granted the status of Probationary Member for two years.

The status of Probationary Member is equivalent to that of the Founding (Full) Members with two limitations:

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- Probationary Members cannot deliver the PEGASUS Certificate and PEGASUS Award to their students
- Probationary Members cannot vote on the admission or exclusion of Members at Council meetings.

After two years from admission and following an assessment of positive involvement in PEGASUS, Probationary Members can be confirmed and assume the same status as the Founding (Full) Members. Confirmed Probationary Members and Founding Members are then identified by the same name of PEGASUS Members.

4. CONCLUSIONS

There is no question that the European aerospace industry, like the non-European remains in fundamental need of scientific and technical talents, skilled engineers and scientists with a strong knowledge and aerospace engineering background. In recent years a trend has emerged among human resources departments of aerospace companies towards hiring general engineers, which can transfer to other sectors more easily. This requires some broad concept for the academic education of the later employee.

The growing integration of industry – the aerospace industry is the most integrated economic sector in Europe – and the globalisation of markets and production means generate new training needs in order to maintain the competitive advantage of the industry. The implications for the preferred employee profiles are twofold. One aspect is the need for motivated workforce, skilled in general and project management, with team work as well as multicultural abilities.

Today’s most wanted profile is a good engineer with a profound knowledge of soft skills, which he can confidently apply.

The output of the PEGASUS network appears relatively adequate to the needs of industry as described above, both in terms of quantity and quality. When the quantitative needs of the European industry can be estimated at around 2600 engineers per year, the output of +5 level aerospace engineers from the PEGASUS network amounts to over 2700 each year. On top of that, PEGASUS institutions also produce almost 300 “Doctorates” (or PhD, +8 levels) per year, which are of great value to the R&D divisions in the aerospace industry.

As we see, the Partnership of a European Group of Aeronautics and Space Universities (PEGASUS) is a great suitability for the aerospace higher education in Romania.

REFERENCES