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A Proposal for Ensuring the Quality of Aerospace Engineering Higher Education in Europe

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Abstract

The paper presents a possible roadmap for the definition of a European quality label for aerospace related higher education degrees. The proposal is the result of a two-years long Horizon 2020 project that has involved a great portion of the European stakeholders in aerospace: Universities, research centres, industries (both small and large) networks, associations and accreditation agencies. The core concept established is that it is possible to establish a sector-specific, content based, quality system, that can complement the existing national or European accreditation systems, providing added value to the internal and/or external quality assurance processes that are in place in most EU countries. The tools and processes proposed are sufficiently simple to be manageable by Universities in addition to their national accreditation processes or as stand-alone assessment. The main goal of the proposed process is the evaluation of the quality of the aerospace curricula in the European context, whereas the accreditation of the programme can be seen as an optional extension of the process, subject to further national regulations. The process is proposed in view of the awarding of a sector-specific, content based, quality label, to be issued by an appropriate legally recognized and qualified institution. A set of 8 field tests with volunteering universities throughout Europe has been performed. They experienced the method as very practical and to the point.

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Keywords: aerospace higher education ; quality in education ; learning outcomes

1. Motivations and objectives

Europe has successfully managed, during the past decades, to ensure a world-leading position in the global civil Aeronautics and Air Transport (AAT) market. A substantial portion of this accomplishment should irrefutably be

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attributed to the excellently-trained human potential ensured through a number of world class European Universities offering aeronautics education. It has been realized, nonetheless, that during the recent years, both the European Aeronautics and Air Transport sectors have been facing tremendous societal, environmental and competitiveness challenges, as well as, concurrently, it has been noticed that aviation related studies are not considered as "prestigious" as other scientific fields such as medicine, law, etc. As a result, the number and quality of aviation engineering students is at risk of not keeping up with the evolving and increasing demand of the sector, to the point where the European Aviation industry might have a shortage of highly skilled engineers. Consequently, in order to reinforce and corroborate the global competitiveness of Europe in the dynamic global market, it is imperative that the European aviation sector (i.e. Industry, Research Establishments, Academia, etc.) improves the quantity, as well as the quality and skills of its engineers and researchers.

The aforementioned eminent necessity of providing the European aviation sector access to a greater, highly-skilled, excellently educated, experienced and motivated workforce has been commonly recognized by all AAT stakeholders as well as, most importantly, by the European Union (EU).

Within this context, the AIRQUAL project, a TEMPUS project funded by the EU Commission described in Gola and Tobaldo (2011), attempted to develop a common qualifications language for Aerospace Engineering academic courses as well as to ensure international comparability among the Russian Federation and three West European countries (France, Italy and Sweden) all represented by academic institutions belonging to the PEGASUS Network. In doing this AIRQUAL provided a benchmark for the application in a broader geographical context of a Quality Assurance method based on the comparison of functions / competences and learning outcomes.

In addition, the Advisory Council for Aviation Research and Innovation in Europe (ACARE) has, already since 2004, recognized the problem of the declining magnitude and deftness of the European aviation engineering and scientific workforce, and accordingly instigated the publication of two relevant studies: an "Education Study" in ACARE (2004) and an "Accreditation Study" in ACARE (2006). Amongst the foremost conclusions of these studies was the acknowledgement of the need to take a concrete action towards the establishment of a platform where university representatives or networks and the demand side (e.g. Industry, Research Establishments) could meet at regular intervals to exchange views on the requested developments of the curricula at universities. In addition, issues such as the importance of identifying and implementing appropriate mechanisms to measure the quality of education through accreditation and student qualification, as well as, of improving the image of a potential career in the Air Transport sector, were also underlined.

Equivalent conclusions and suggestions have been outlined by ACARE Working Group 5 (i.e. Prioritizing research, test capabilities and education) which had the responsibility to provide input to the Strategic Research and Innovation Agenda (SRIA), related to the educational needs of Europe towards the ambitious strategic goals of Flightpath 2050. In particular, ACARE WG5 in ACARE (2012) has intensely and very keenly stressed the prominent need to establish a fully integrated European aviation education system capable to deliver the required high-quality workforce.

The European aerospace sector is not only the most integrated one with regard to industry, but probably it is also the most advanced one when its perspectives of integration in the educational domain are considered. Indeed, not only academia, in this specific case within the PEGASUS Network (2017), but also other structures (e.g. ACARE) have already established some sound bases on which a real harmonization of the aerospace engineering education in Europe may be designed. Leveraging on these past activities, the PERSEUS project has been conducted in order to define a clear methodology for the evaluation of aviation related higher education programmes and evaluate a series of Universities on the basis of their aerospace curriculum in order to check whether they can be approved by the Industry, hence ensuring that the typical engineer graduate is compliant with their expectations (required learning outcomes, competence profiles for aero-engineering curricula, etc.).

2. The quality systems of EU aerospace education curricula

An analysis of accreditation schemes has been carried out for those 25 member states of the European Higher Education Area (EHEA) were aerospace-related programmes are on offer. The analysis focused on the questions to which extent degree programmes have to follow requirements stemming from external quality assurance regulations which would have an impact on the design and delivery of aerospace programmes. The analysis has highlighted those aspects which are of direct relevance to those designing and offering programmes. Thereby, the distinction between