

EDUCATION AND TRAINING IN THE AVIATION INDUSTRY IN THE EUROPEAN UNION - THE LEARNING AND DEVELOPMENT OF SKILLS IN THE LABOR MARKET IN THE AIRLINE INDUSTRY

VZDELÁVANIE A ODBORNÁ PRÍPRAVA V LETECKOM PRIEMYSELE V EURÓPSKEJ ÚNII - UČENIE A ROZVOJ ZRUČNOSTÍ NA TRHU PRÁCE V ODVETVÍ LETECKEJ DOPRAVY

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Abstract

The aim of the paper is to define the structure of education of workers in the aviation industry in the European Union. The study will diagnose skill gaps in the specific sectors of aviation (Airlines & Aircrew, ATC, Airport Operations, and Manufacturing & Aircraft Maintenance) Research will also assess the preferences of employees of the aviation sector concerning the learning and training.

Key words: education, aviation training, skill gaps

Abstrakt

Cieľom tohto príspevku je definovať štruktúru vzdelávania pracovníkov v leteckom priemysle v Európskej únii. Štúdia bude diagnostikovať medzery v zručnostiach v konkrétnych odvetviach letectva (letecké spoločnosti a posádka lietadla, ATC, letiskovej prevádzky a výroba a údržba lietadla). Výskum tiež odhalí preferencie zamestnancov v odvetví leteckej dopravy, pokiaľ ide o vzdelávanie a odbornú prípravu.

Kľúčové slová: vzdelávanie, výcvik v letectve, medzery v kvalifikáciách

INTRODUCTION

The airline industry in the European Union is over 150 airlines operating the regular connections. In addition, it includes more than 400 airports and 60 navigation agencies. The airline industry in the European Union employs more than 3 million people. The airlines and the airports are responsible for producing more than 140 billion GDP in the EU¹. For this reason more than a billion Europeans can travel as tourists and businessmen, generating more workplaces in the sectors related to transport and tourism, as well as in the sectors for which movement of workers is only a mean to achieve other goals. Provision of safe transport by air is a priority for the airline industry. The competencies of the workers of the companies providing services in the airline sector are the key elements affecting safety. The article aims at providing the educational structure of the workers in the airline industry and the possible competence gaps thereof. For this reason the article will present the following:

¹ http://ec.europa.eu/transport/modes/air/internal_market/index_en.htm, (access: October 2014)

- Basic information about the regulations concerning training requirements;
- The results of the studies on the structure of education, potential competence gaps and the method of acquiring and updating knowledge preferred by the workers.

1. ADJUSTMENTS OF TRAININGS IN THE AIRLINE SECTOR

1.1 The degree of regulation of trainings in the airline industry

The entire airline sector in the European Union is strictly regulated. The organizations establishing the rules and supervising their observance are the International Civil Aviation Organization - ICAO, the European Aviation Safety Agency - EASA and the national aviation authority - the Civil Aviation Authority. The following diagram illustrates in a simplified manner the current requirements and regulations as to the training and licensing in each of these sectors herein.

In the article, it was decided to discuss the airline sector, applying the following, simplified division of the industries: Airlines & Aircrew, ATC, Airport Operations, and Manufacturing & Aircraft Maintenance. In accordance with the regulations of EASA the following rules are applied to the Airlines & Aircrew sector:

- Part-FCL: regulating the licensing of pilots and airline crew and methods of recognition of the national licenses in different EU countries and countries outside the EU (conversion of national licenses and license forms of non EU states),
- Part-MED: medical requirements
- Part-CC: requirements for the cabin crew
- Part-ARA: requirements for supervision
- Part-ORA: requirements for training organizations, FSTD operators and the Centres of the Airline Medicine ²

The provisions of ATCO Licensing relate to the Air Traffic Control sector³. The rules for certification of the airports and the airline crew basic trainings are described by the provisions of Part-ADR.AR, Part-ADR.OR and Part-ADR.OPS⁴. The provisions relating to the Manufacturing & Aircraft Maintenance are exactly described as well:

- Part-M: Measures to be taken to ensure that airworthiness is maintained, including maintenance. Conditions to be met by the persons or organisations involved in such continuing airworthiness management.
- Part-145: Requirements to be met by an organisation to qualify for the issue or continuation of an approval for the maintenance of aircraft and components.
- Part-66: Definition of the aircraft maintenance licence. Requirements for application, issue and continuation of its validity.
- Part-147: Requirements to be met by organisations seeking approval to conduct training and examination as specified in Part-665.

² Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council

³ Commission Regulation (EU) No 805/2011 for air traffic controllers licences and certain certificates pursuant to Regulation (EC) No 215/2008

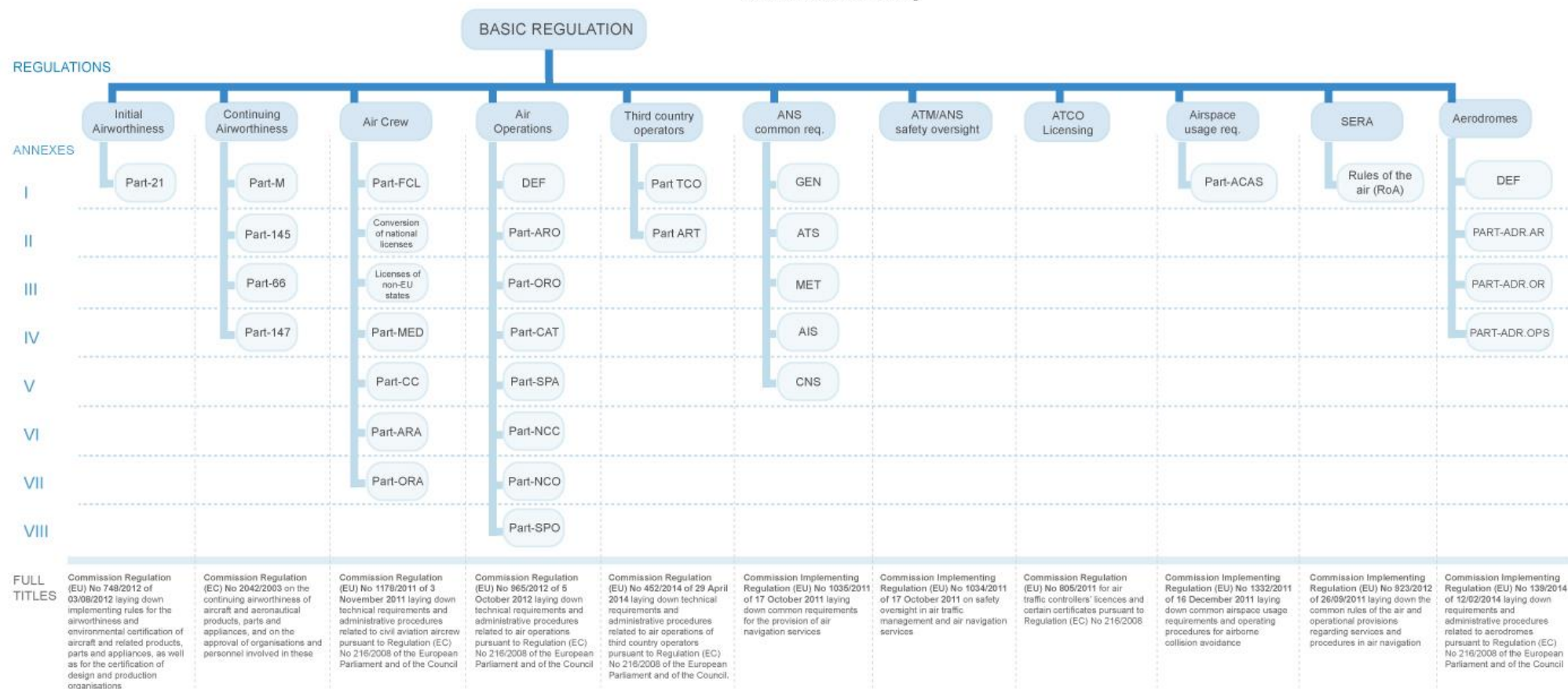
⁴ Commission implementing Regulation (EU) No 139/2014 of 12/02/2014 laying down requirements and administrative procedures related to Regulation (EC) No 216/2008 of the European Parliament and Council

⁵ Commission Regulation (EC) No 2042/2003 on the continuing airworthiness of aircraft and aeronautical products, parts and appliances, and on the approval of organisations and personnel involved in these

Regulations Structure

Each Part to each implementing regulation has its own **Acceptable Means of Compliance and Guidance Material (AMC/GM)**. These AMC and GM are amended along with the amendments of the regulations. These AMC/GM are so-called 'soft law' (non-binding rules), and put down in form of EASA Decisions. A comprehensive explanation on AMC in form of questions and answers can be found on the FAQ section of the EASA website.

Furthermore, **Certification Specifications** are also related to the implementing regulations, respectively their parts. Like AMC/GM they are put down as Decisions and are non-binding.



Graph 1. Basic regulation of Aviation Industry

Source: European Aviation Safety Agency, https://www.easa.europa.eu/system/files/ifu/regulations_structure-12062014.jpg

2. THE STRUCTURE OF EDUCATION AND COMPETENCY GAPS

2.1 The level of education of the civil airline crews in the European Union

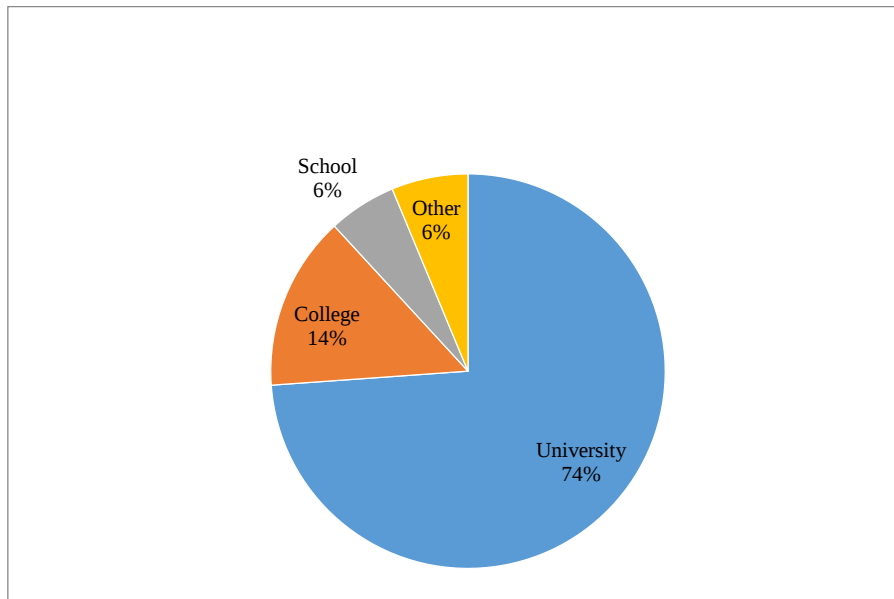
The regulations described in the previous section do not specify the degree of educational requirements depending on the workplace and the function in the airline industry. The rules say about licensing and certification of the crew. A good example is a plane pilot license or a helicopter pilot license. In order to obtain such a license, a candidate must participate in a series of theoretical and practical trainings in the Aviation Training Centres Flight Training Organisations. In accordance with the provisions of EASA, the training center can be any entity that meets appropriate requirements, specified in the regulations⁶. The regulations do not specify the status of the entity - we do not know whether it is a University or College. The situation is similar as far as the airline mechanics are concerned - in order to obtain a license specified by the provisions of Part-66; a candidate must complete the relevant theoretical and practical training at the centre of Part-147 type. The centre can be any entity that meets the requirements. For example, in Poland for a total of 14 organizations Part-147 consists of the centres established under:

- The operators of the status of universities (the Institute of the Airline Technique, the Department of Mechatronics and Aviation, the Organisation of Training for the Support Crew "Rzeszów University of Technology/WBMiL OKL", the Organisation of Training for the Technical Crew of the State Professional School in Chełm) - totally three centres;
- The entities with the status of the upper-secondary professional schools (Airline Technical Secondary School No. 9 of Heroes of Narvik, the European Aviation Technical Secondary School, the County Centre of Professional Education of Zygmunt Puławski in Świdnik) - totally three centres,
- 8 centres established by private entities⁷.

The situation is similar in the rest of the European Union. This example was used only to realize the diversity of the existing paths to obtain one of several airline licenses. In September 2014 the study to specify the structure of education of the workers of the airline sector in the European Union was completed. The study involved on-line surveys and was conducted within the project: the Aeronautiv Industry Skills Resolutions for a more Efficient Vet Offer - AIRVET, co-financed by the European Union funds. The study included a total of 2,000 respondents from Portugal, Spain, France, Italy, the United Kingdom and Poland. The results of study specifying the profile of education of the worker of the airline industry are illustrated by graphs 2.

⁶ Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council

⁷ http://www.ulc.gov.pl/_download/osrodki_szkolenia/mto_part_147_30052014.pdf (access: October 2014)

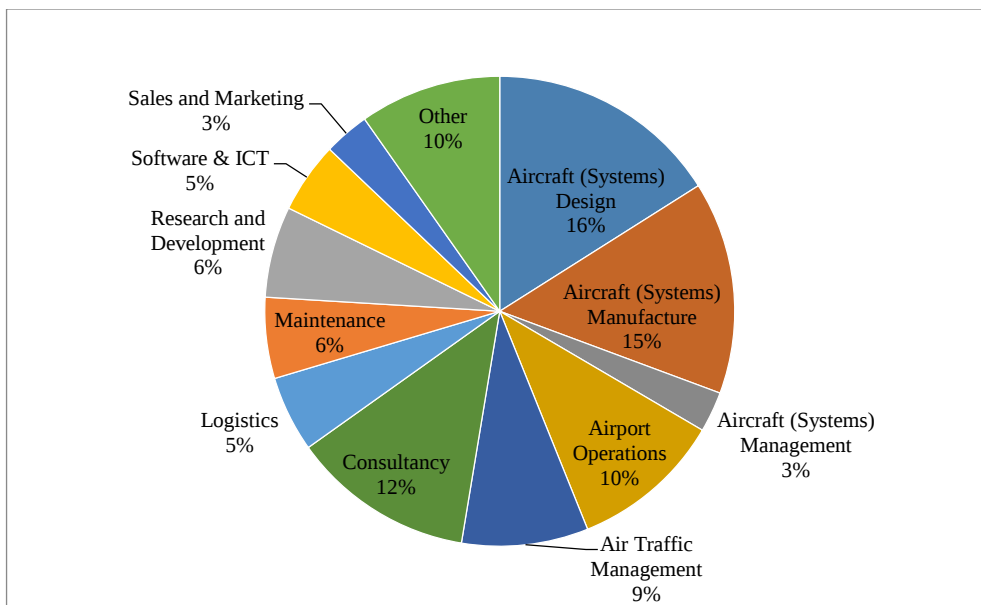


Graph 2. Workers highest educational qualification

Source: <http://airvet-project.eu/>(access: October 2014)

In accordance with the result of the study, 88% of people employed in the airline industry graduated from high school - 74% from University, 14% from College respectively. 6% of the workers graduated from upper-secondary schools, and the remaining 6% used other forms of education.

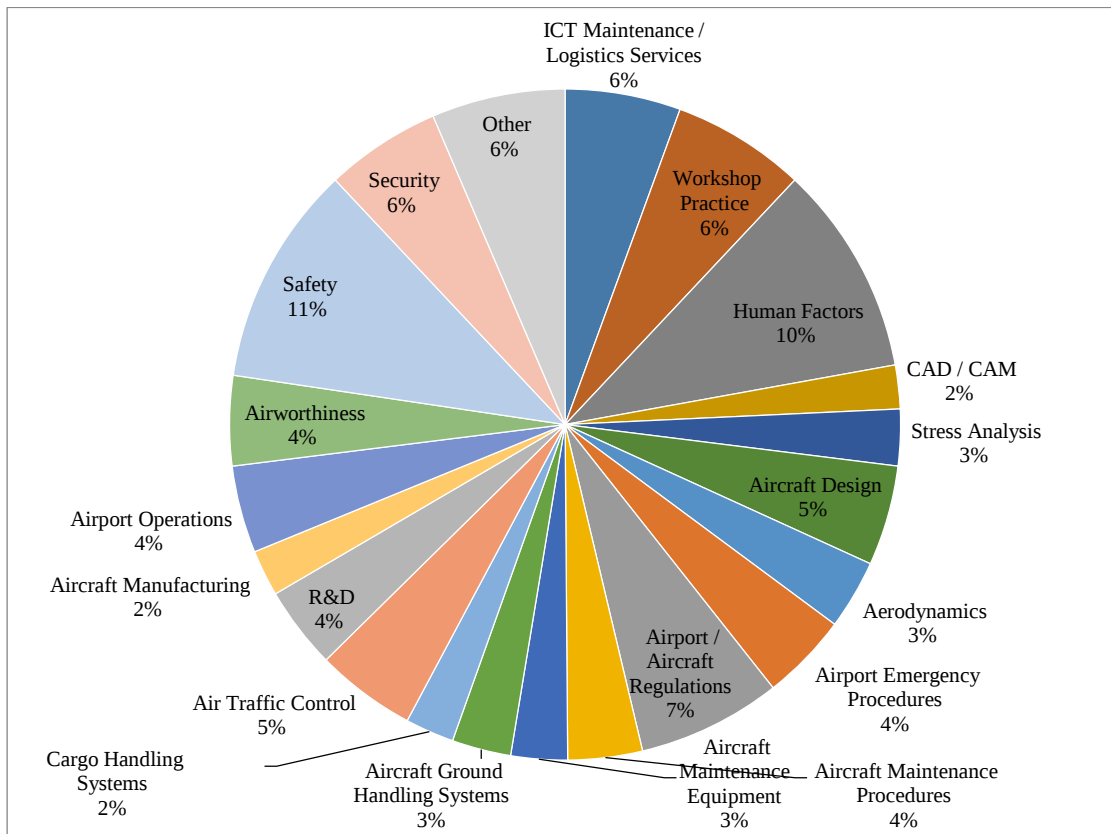
The diagram below shows the structure of the employment of people participating in the study.



Graph 3. Job Categories of Workers Participated in Survey

Source: <http://airvet-project.eu/>(access: October 2014)

On the basis of Graph 3 it can be concluded that the study was attended by the representatives of all sectors of the airline industry performing different functions in the structure of their companies. The study did not include the educational profile of the respondents, and only allowed specifying their workplace. For this reason, it can be assumed that some people, who graduated from colleges or universities, did not gain education associated directly with the airline industry. This is also suggested by the answers of the responders to the question about the type of training they would like to participate in. 52% indicated various types of technical trainings⁸. The scope of trainings is presented in the below diagram.



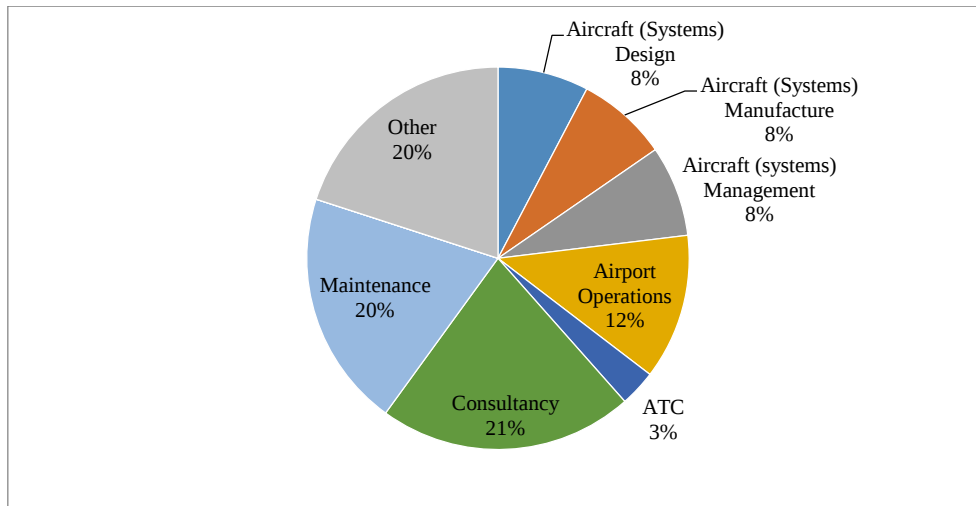
Graph 4. Technical Training attend to Workers

Source: <http://airvet-project.eu/> (access: October 2014)

In a situation when more than half of the interviewees declared willingness to participate in the training characteristic for their workplaces, it can be assumed that a significant proportion of people working in the airline sector and having higher education had to supplement their competences in order to take a job.

Managers were a separate group participated in the study. Their workplaces are exactly shown in the below diagram.

⁸ Aeronautic Industry Skills Resolution for a more Efficient Vet Offer - AIRVET, Coventry University, p.7



Graph 5. Manager's Job Role Participated in Manager's Survey

Source: <http://airvet-project.eu/> (access: October 2014)

2.2 Competence gaps among the workers of the airline industry

Based on the survey the competence gaps in five basic areas were identified:

1. Airline
2. Airport Operations
3. Maintenance and Overhaul
4. Manufacturing
5. Air Traffic Control

The exact characteristics of the competence gaps identified by the workers of the Aviation Industries are in the below table:

Airline	Airport Operations	MRO	Manufacturing	ATC
Aircraft Management and Operations	Detection of threats at the airport based on observation of Passenger Behaviour	Procedures behind blade balancing, analysis of exhaust gas temperature (EGT) margins and processes / reasons behind various non-destructive testing (NDT) methods	Shortage of programmers/machinists who are capable of programming the CNC machine for laser sintering. This is for prototype - ideally they should be PhD students with a machining (CNC workshop background)	R&D, Software engineering in ATM
Customer Relationship Management (CRM)	Cargo Handling	Maintenance Services and ICT/Logistics	IT skills for package assessment, drawing programmes	Tower ATC OJT
Flight dispatcher	Training Coordinator complementary Ground Movement	Human factor in organizations Parts 145, weight and balance,	Workshop related training, Various moulding methods, Production procedures	Airborne side
Professional customer service	Security Environment	Maintenance Steering Group	Lean systems and its implementation into the workplace	ATC Tools
Practical flight training for commercial pilot license (CPL)	Carriage of Dangerous Goods DGR	Continuing airworthiness	Operations Management, Aircraft Performance, fuel Consumption	Air navigation and airspace management
ATPL, CPL	Acceptance Animal transport	Structural repairs	Aircraft Stress Analysis training, 5S and Lean Management	Air traffic Management and flexible use of airspace
Safety applied to the air traffic services	Construction and rehabilitation of airport infrastructure	Composites, non-destructive testing	CAD/CAM/CAE training and other industrially required training such as Lean/Six Sigma would be preferable	
Basic pilot course and driver course with practical simulator			Documentation Aviation, CAD / CAM / CAE, 3D design Unigraphics NX	
			Avionics	

			<i>More in depth PPAP/PFMEA, and Workshop practice</i>	
			Aerodynamics and Flight dynamics	
			Aircraft Reliability	
			Lean and Six Sigma	
			Software training-Catia, flowmaster, ansys	
			RAMS, PART 21	
			<i>Training in EMI/EMC</i>	

Tabel 1. Skill gaps in Aeronautical Industry

Source: Aeronautic Industry Skills Resolution for a more Efficient Vet Offer - AIRVET, Coventry University,
p.9

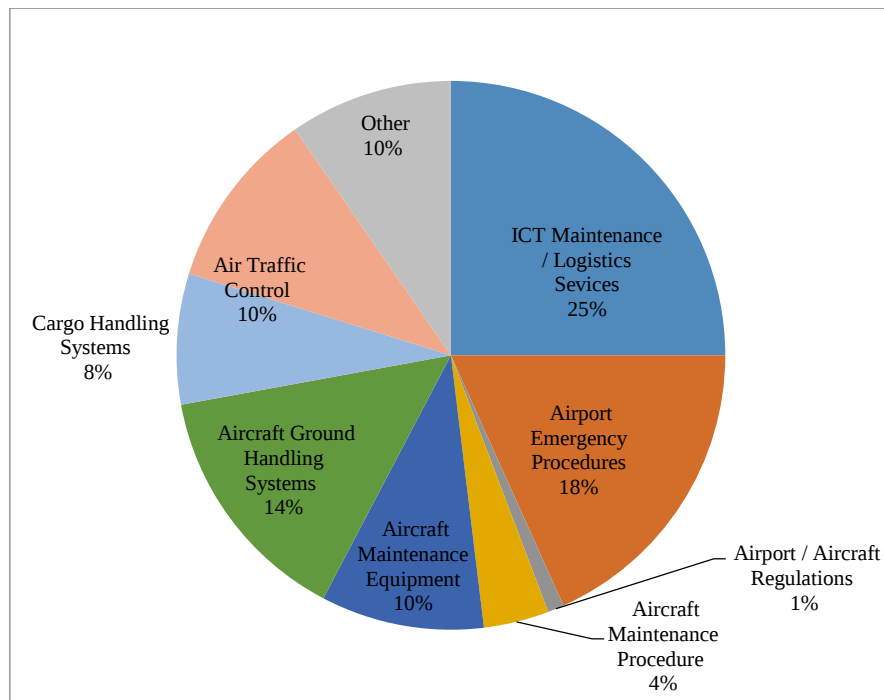
The training needs which didn't easily categorise according to one of the five themes above are outlined below.

Common Training	Uncategorised
EASA Regulations, Changes and Implementation	View that undergraduate training should include more industry contact. Additional short time spent in industry-more than just a placement year
New tools and technology	<i>Aerospace industry processes, as I'm new to the industry. (Previous experience in automotive)</i>
Software coding and generation	Writing a proposal for Horizon 2020
General Management, Project Management	DGR
MATLAB / Simulink and ACSL training	Motion Controller
Negotiation and Risk Management	HPL
Computer Security and Data protection	Financing for the air transport sector
Airworthiness	General Management board footprint SP
Language - English	All technical and management areas related to Aviation Industry
Analysis of eye movements and physiological parameters and safety	Management and administration of LMS platforms
<i>Human Factors, Security and Safety</i>	Technical training related to the actual operational principalmente. Bajo my perspective, there is a wide gap between actual operating and understanding of it has a perspective of Engineering.
Modeling Interactive systems	<i>Air operations.</i> - <i>Unmanned Aircraft Systems.</i> - <i>National and European legislation.</i> - <i>Financial management.</i>
Emergency Management and Complex Systems	<i>RPAS training as this is an emerging area in the aviation industry with great potential for development in the coming years.</i>
Specialized courses in literacy teaching and conducting classes. Courses to obtain air permission.	
Quality Management and Audit	
The training of sales and communication	
Health & Safety	
Emergency Procedures	
Regulations and standards development aeronautical SW	
Risk Analysis and Management	
Design training (elearning and OJT)	
Practical Training on implementation of Safety Management Systems	
<i>Single European Sky legislation</i>	

Tabel 2. Skill gaps in Aeronautical Industry

Source: Aeronautic Industry Skills Resolution for a more Efficient Vet Offer - AIRVET, Coventry University,
p.10

The above tables show the competency gaps specified by the workers of the AI. In addition, the study considered the competency gaps specified by the persons of managerial functions. Their answers are presented in the below diagram.



Graph 6. Areas of Skill Gaps of the Manager's Manager's Survey
Source: <http://airvet-project.eu/> (access: October 2014)

The open ended question yielded the following results for the AI managers. Again the results have been categorised into the five themes outlined in the previous section.

Airline	Airport Operations	MRO	Manufacturing	ATC
Training and certification in the field of SAPR	The role of the Network of Operations	New type introductions - OEM training New operational contracts - new task procedure development	Increased attention to the savings possible with advanced logistics services	Surveillance and communication techniques involving satellites
Flight Operations	Management processes handling at Ground	Organisation of maintenance	Advanced Systems and Modern Materials	SESAR operational concept
Strategic management of airlines, route analysis	<i>Recognition and assessment of risk on the part of front line staff</i>	Advanced Testing Equipment	Systems Engineering, Autonomous Systems, Avionics and Sensors	
All related to the management of an airline (network systems development, financial, commercial, accounting and administration, purchasing, etc.)	Management of airport, operations of the airport, economy and airport funding and marketing	Understanding changes in approvals and structure	Advanced low cost manufacturing, materials and coatings, power management (propulsion and aircraft systems)	
	<i>Aerodrome Certification and Aerodrome Safety Management Systems. ICAO Annex 19</i>	Practical aspects of Maintenance i.e. getting their hands dirty and not just sit at desk	<i>Composite Materials</i>	
	Airport Management	Training route for Pt 147 / Pt 66 / Pt 145	CAD	
	Management of major airport and Infrastructure development	<i>Design, analysis, manufacturing and repair of aeronautical structure</i>	Organisation, procedures and risk management for suppliers of tooling	
	Airport Systems Integration and Management Center	Training regarding the certification regulations and procedures	CAD/CAM 5 axis and Process optimization in production management	
	New Rules for airports	Changes in regulations PART M/145/66/21	Logistics and Supply chain management	
	<i>Cargo Handling System</i>	ICT Maintenance/Logistics Services	New CAD/CAE tools CATIA V6	
		Specific aircraft type maintenance engineer training, various types	Management Supply Chain	
		Management courses for technician	Flight Control Software	
		ICT Fault Analysis	Materials	

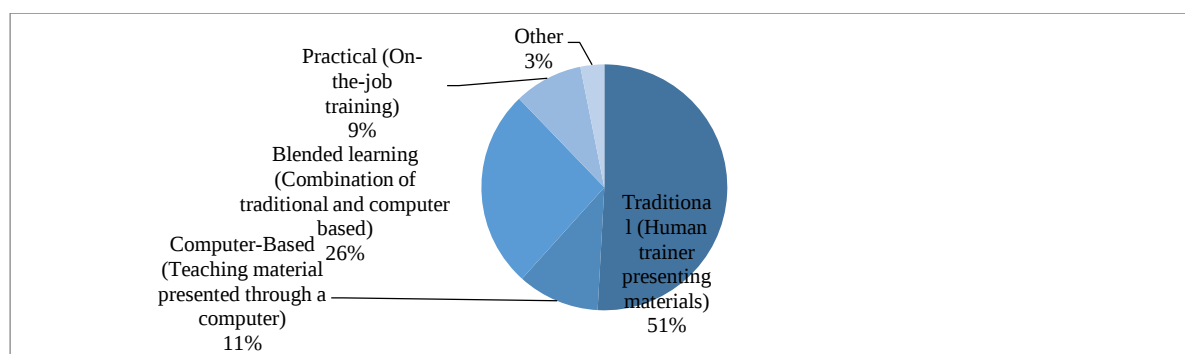
The training needs which didn't easily categorise according to one of the five themes above are outlined below.

Common Training	Uncategoris
Security of data	The use of EU funds in The new budget perspective Aviation General Aviation - Raising funds for The maintenance of The exclusive use of airports - The safety of operations AOC and AWC in small organizations - The SMS (Safety Management System) in practice - Training for informants AFIS
EASA Regulation	SMS (Safety Management System)
Organisational aspects of security	Training on RPAS (Remotely Piloted Aircraft Systems)
Human Factors	Analysis of the air transport market
Integrating Human Factors	Simulation, Virtual Reality
Interpretation of the provisions of Regulation 295/2012 EU	Enter the RPAS airspace, with all that implies in the design phases, test, certification, operation, maintenance
Risk Management	Promoting innovation
Audit	RPAS, Galileo applications
Risk Analysis	
Stress Management	

3. TRAINING PREFERENCES

3.1 Preferences of employees of the aviation sector concerning the learning and training.

The airline industry is associated with modernity and progress. 44 years after the first flight of the Wright brothers the airplane crossed the sound barrier (1947). 14 years later, in 1961 a man flew into space for the first time, in order to land on the moon 8 years later. The old pilots' saying states that the airline regulations are written with human blood. Most trainings in the airline sector were developed to ensure the highest level of security. There is no difference between the training of the pilots, the airline mechanics, the workers of the airports and the navigation services. The trainings are to improve traffic operations, save time and provide convenience of the passengers. However, safety is always the priority. The persons participating in the study within the project: the Aeronautiv Industry Skills Resolutions for a more Efficient Vet Offer were asked a question about the preferred way to provide the trainings. The answers are shown in the diagram.



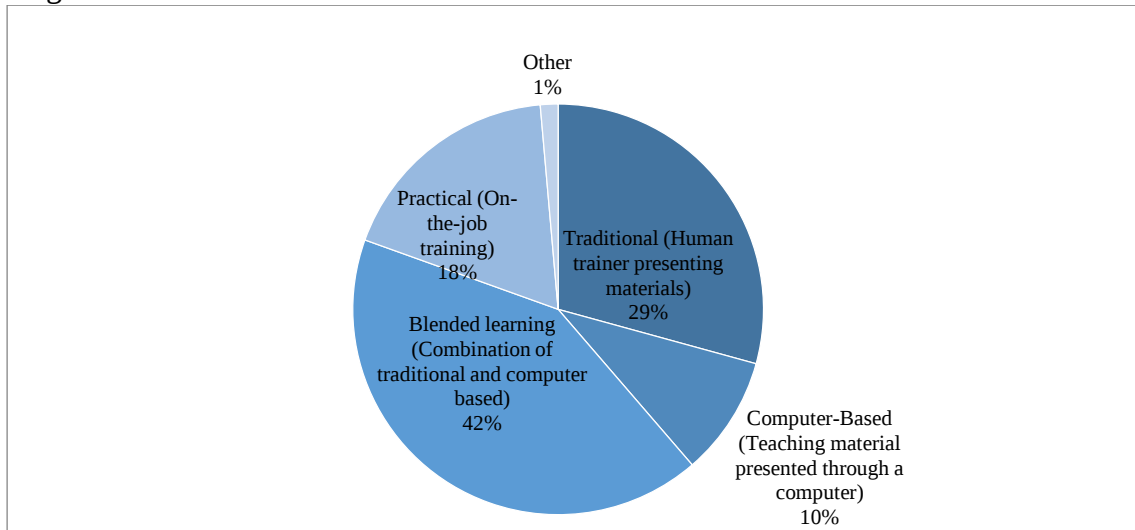
Graph 7. Mediums of Training Delivery

Source: <http://airvet-project.eu/> (access: October 2014)

Despite the modernity of the airline industry, most study participants showed a conservative attitude. 51% of the studied indicated that they prefer the traditional training methods - lecture with a trainer/ instructor. 26% of the respondents indicated that the appropriate method is the mixed training - the part of the material in on-line form, the other part the form of a lecture.

11% of people indicated the Computer-Based Training, and 9% indicated the training of OTJ type.

The answers looked different when the participants were asked to express their opinion about how the trainings will look in the future. Their answers are illustrated in the following diagram.



Graph 8. Future Training Delivery Media Preference

Source: <http://airvet-project.eu/> (access: October 2014)

The participants in the study indicated that the future most popular methods of training are the following: Blended learning – 42%, traditional learning – 29%, OTJ training – 18% and computer based training – 10%.

CONCLUSION

Aviation is a field, in which the trainings in individual companies have a major impact on the proper functioning of the entire industry. Properly and comprehensively trained worker guarantees safety of the flight operations. For this reason, the training market, the educational market is strictly regulated by the provisions. Each worker, before it starts functioning at the workplace, must attend the appropriate trainings to obtain proper licenses and certificates. However, even in such a highly regulated environment the competency gaps can occur. For this reason, the supplementary and periodic trainings are held. Education in aviation is the domain of private companies and external centres. The employer is responsible for ensuring an adequate level of training. The properly prepared market of the educational services, including higher education, can significantly contribute to increasing the competence of the workers and the positive impact on the labour market, providing the employers of the Aeronautical Industry with the adequately trained crews.

References

1. http://ec.europa.eu/transport/modes/air/internal_market/index_en.htm, (access: October 2014)
2. *Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council*

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