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Comparison of the learning units with the national qualifications frameworks, regulations and qualifications

Education and Culture DG

Lifelong Learning Programme

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1. The European policy context: EQF and ECVET

The Lisbon Strategy of the European Union (EU) views education and training as an important factor on the road towards making Europe one of the leading regions in the global economy. At the same time education and training are defined as a key factor for improving social cohesion in the EU.

The shift from an industry-based economy to a knowledge-based one also involves a change in the conception of vocational education. This is expressed by the idea of lifelong learning. In the context of the Lisbon Strategy the EU promoted initiatives in education and training which are documented in several strategy papers. For instance, the European Council, in its report '*The concrete future objectives of education and training systems'*, defines the following strategic objectives:

- Better quality and improved effectiveness of the education and training systems in the European Union.
- Easier access to the education and training systems for all.
- Opening of the education and training systems to the wider world.

Points 2 and 3 are of special interest for our topic. Building on the intention to enable easier access, they formulate the intention to create open flexible learning environments in which citizens can access education and training systems at various stages of their lives from childhood to old age. The key phrase 'opening of the systems' explicitly points out that this is necessary in order to adapt the systems to the greater professional and geographical mobility of people. In earlier times the EU had already initiated programmes to support the geographical mobility and exchange of learners. But now these initiatives receive even stronger support because they are regarded as a strategic element for improving European cooperation. Particular attention is paid to the "advancement of the regulations concerning the recognition of prior learning and the Europe-wide recognition of qualifications and diplomas" (Concrete future objectives of education and training systems 2001: 17).

In the same year the Commission, in its communication 'Towards a European area for lifelong learning', formulated the goal "on the one hand to enable people to choose freely between learning environments, workplaces, regions and countries in order to make the fullest possible use of their knowledge and competences. On the other hand, it shall help to realise the objectives of the EU and the accession countries with regard to greater prosperity, integration, tolerance and democracy" (2). The same document emphasises the assessment and recognition of formal, non-formal and informal learning. This would require a "comprehensive new concept of learning assessment" (16) in order to integrate the different locations and forms of learning. This is an important step towards a 'European area of lifelong learning', which would facilitate "the transfer and mutual recognition of formal qualifications" (17). There were many efforts in this direction at the European and national levels before, but "they did not lead to a comprehensive

reference framework that would regulate the transfer of qualifications and competences (between different levels of formal education systems as well as across institutional, sectoral and national borders)" (17).

In 2002 the ministers responsible for vocational education and training (VET) of the EU Member States, together with the Commission, adopted the Copenhagen Declaration, which was fundamental for the EU policy in the following years. Once more this declaration emphasises the crucial role of high quality vocational education for the Lisbon Strategy. VET is an integral part of a strategy that integrates social inclusion, cohesion, mobility, employability and competitiveness. Accordingly vocational education is an essential component of EU economic and social policy, and the following priorities are defined:

- strengthening the European dimension in order to facilitate and promote mobility;
- transparency, information and guidance through the development of various tools and instruments;
- recognition of competences and qualifications. One of the first activities should be to explore the opportunities for promoting the transparency, comparability, transferability and recognition of competences and qualifications between different countries and levels through the development of reference levels, common standards for recognition and common instruments, e.g. a credit system for VET;
- quality assurance by means of European cooperation, which should take into account especially the needs of teachers and trainers.

The Copenhagen Declaration is arguably the first document that explicitly defines the development of a credit system for vocational education as a strategic objective. This ultimately led to the preparation of the 'European Credit System for Vocational Education and Training' (ECVET), with the intention to set up a credit system that would complement the credit system in European higher education (ECTS) in order to facilitate geographical mobility between different education systems as well as systemic flexibility in progression to higher education (HE).

The Copenhagen Declaration also set in motion the process of developing a European reference framework for qualifications, which finally led to the adoption of the European Qualifications Framework (EQF) in 2008. To put it differently, the strategy to create an EQF was motivated by the goal to develop a credit point system. The reason is that such a system requires a common point of reference that allows for defining the levels of the competences and qualifications that are supposed to be transferred from one system to another.[1]

The development of ECVET is thus a constituent of the European lifelong learning strategy in response to the priority objective to facilitate the "actual recognition of formal

[1] This also explains in part why the development of the EQF proceeded faster than the development of ECVET.

qualifications attained in other countries and educational sectors, as well as the non-formal and informal learning completed there, by means of increased transparency and quality assurance" (Council conclusions on lifelong learning June 2002: 2).

According to the Commission's reasoning the main aim of ECVET is the improvement of learners' mobility in three dimensions:

- geographical mobility;
- professional mobility in the vertical as well as in the lateral dimension, i.e. between occupational areas as well as between labour markets;
- educational mobility, i.e. formal, non-formal as well as informal learning shall be integrated in one system of learning, thereby facilitating the transition between the different educational systems.

ECVET is defined in the various Commission documents as an instrument "to facilitate the transfer, recognition and accumulation of assessed learning outcomes of individuals who are aiming to achieve a qualification" (Recommendation of the European Parliament and of the Council of 18 June 2009 on the establishment of a European Credit System for Vocational Education and Training: 11). It is an instrument for the description of qualifications in terms of units of learning outcomes according to the concepts of knowledge, skills and competences. These units, which are associated with specific numbers of credit points, can be transferred and accumulated. The intention of ECVET is that these accredited units of learning outcomes can be accumulated across countries and learning contexts in such a way that they may lead to a full qualification in accordance with the national legislation.[2]

The key concepts of ECVET also appear in other European educational strategies, for example the Bologna process: lifelong learning, which is disintegrated into learning outcomes and learning modules as building blocks of the educational or learning process. As discussed above, ECVET is complemented by the EQF: "[T]he actual implementation of ECVET should be based on common reference levels proposed by the EQF. The European framework should thus be a powerful lever for the adoption of ECVET by the various competent bodies, responsible in the Member States for its implementation at national level, regardless of the existence of a national qualification framework" (Commission staff working document: European Credit system for Vocational Education and Training (ECVET), SEC(2006) 1431; 2006: 5). ECVET and EQF can be regarded as twins, which are based on the same principles:

- learning outcomes, which are described in terms of knowledge, skills and competences;

[2] As the European education and training policy is based on the Open Method of Coordination, the measures taken in this area are not binding. Accordingly the national legislation takes precedence over the EU recommendations. However, the intention of the Commission is to put these recommendations into practice throughout the EU.

- learning processes that are organised in terms of units of knowledge, skills and competences;
- orientation towards mobility and flexibility of citizens;
- permeability of education systems.

And despite all statements to the contrary and the "Open Method of Coordination" (OMC), which is applied in the area of education and training to coordinate the political strategies, the implementation of these strategies in the EU Member States means an increased social pressure towards a homogenisation of VET systems[3]. At the same time the introduction of ECVET and EQF can be regarded as a part of a wider strategy of the Commission, which is promoting, since the 1990s, a paradigm shift in the orientation of education and training systems with a view to changing the focus from education to learning processes.[4]

This paradigm shift is expressed by the fact that ECVET as well as the EQF put the term 'learning outcomes' into the centre. The emphasis is put on 'outcome' while the 'input' and learning processes are largely neglected. In this regard the strategies in question exemplify the idea to regulate education and training systems from outside through a management by results. It has to be expected that the way results are defined will have a significant influence on the configuration of these systems.

Unlike some other generalised media, ECVET does not evolve from the bottom to the top but is established through a political top-down process. In this aspect the ECVET process is similar to the Bologna process, which was triggered by the declaration of four European ministers responsible for higher education. At the same time there are fundamental differences, though. The credit system for higher education (ECTS) was a response to the difficulties encountered by students who increasingly went abroad for parts of their studies. A similar observation cannot be made in the case of vocational education. On the contrary, one of the objectives of ECVET is precisely to increase the geographical mobility of VET students and the European mobility of employees. Moreover, the structures of higher education in Europe are much clearer and more homogeneous than the VET structures. In spite of this higher degree of comparability and homogeneity, however, the implementation of the Bologna process – and the associated standardisation across national and subject-specific particulars – led to some

[3] The topic of our discussion is not whether a homogenisation of the education and training systems is desirable for the sake of greater cohesion in the EU. But there is always the question in the background as to which model is chosen as reference and whether 'one best model' exists at all.

[4] This paradigm shift is in line with the policy of empowerment, which assigns to the individual the responsibility for his journey through life, his career and his learning pathway. It is also an expression of the attitude to view anything from the perspective of a supplier-customer relationship. But this concept does not take into account that a learning process is typically a teaching process as well. The situation that someone learns something all by himself is an exception. In general learning is a social process that involves also persons who know more about the learning area in question. This does not mean it is necessary to return to the generalisation of the traditional master-apprentice situation, but rather to conceive of learning situations as an interactive process in which the roles of teachers and learners are defined less exactly. Examples can be found in adult education, where teachers have greater theoretical knowledge while the learners have greater practical knowledge and professional experience.

dysfunctions. The Bologna process also absorbed resources that were withdrawn from other areas of activity.

The AEROVET project is one of several pilot projects of the EU and focuses exclusively on the European aerospace industry. This is a sector that can roughly be divided into two areas: the segment of production, in which the AIRBUS enterprise clearly dominates, and the segment of aircraft maintenance, which is dominated by the large aviation companies. In a preceding project work process analyses were used to identify a number of typical work professional tasks, which are transformed into learning units in the current project. In a following phase of the current project the extent to which these units are appropriate for supporting the European mobility of learners in the two segments in accordance with the ECVET specifications was tested.

The following report consists of two main sections. The first section briefly describes the recent developments in the VET systems of the four participating countries, paying special attention to the relation of the relevant national qualifications in the aerospace industry to the qualifications frameworks concerned.

In the second section the learning units are assigned to the respective national qualifications. Without implying any anticipation of the results at this point, the observation can be made that the extremely uneven distribution of the learning units between the different national qualifications is another justification of the strategy to proceed from work processes to the learning units. It would have been virtually impossible to develop common units for this economic sector on the basis of the vocational curricula from (only) four countries.

In the concluding section we summarise the main results with a view to the specific objectives of this project phase.

2. Recent developments in vocational education in the sector and relation of the relevant qualifications to the qualifications frameworks

A: France

A recent development which occurred between the preceding project AERONET and the current one is the reorganisation of training cycles in secondary vocational education, which takes place after the 9th grade (classe de 3ème).

According to the former regulation, in order to be admitted to Bac Pro[5] studies (2 years) one first had to complete a two-year programme leading to a BEP[6] or sometimes a CAP[7]. This meant that it took a total of 4 years to achieve a Bac Pro. This was considered to be not quite fair in comparison to the other courses because all other Bacs (general – général – and technological – technologique –) took only 3 years after the 9th grade and continue to do so. Now all Bac Pros can be completed in 3 years, including those for aeronautics qualifications. At the same time BEPs are almost completely abolished, and CAPs now exist in two versions. The first version is identical with the previous one and remains "vocationally" oriented. Its target group are trainees who do not wish or are not able to attain the Bac level and who wish to enter the labour market. The second version has been reorganised as an intermediate certificate with a propaedeutic function in that it provides an introduction to the knowledge required for a vocational area as a prelude to programmes leading to proficiency. The learners are either obliged to take it at the end of their second year (in case they study at a school) or can take it on a voluntary basis (if they undergo an apprenticeship). However, the candidates can proceed to the third year of studies even when they have failed in the examination. The changes are shown in Figure 1.

The reform concerns only the organisation of the courses. The tasks and responsibilities of for which the diploma is supposed to qualify (the target occupation) remain unchanged. The reference profiles (référentiels d'activité professionnelle) on which the certification is based remain the same for the time being. What has changed are the teaching curricula (4 year programmes restructured into 3 years).

Notwithstanding this reform the Bac Pros retain their position in the French NQF. They are assigned to level IV, together with other Baccalauréats. According to the principles of the system this level gives access to higher education (see below).

[5] Baccalauréat Professionnel = VET-based university entrance qualification
[6] Brevet d'Etudes Professionnelles = certificate of completed vocational education and training
[7] Certificat d'Aptitude Professionnelle = certificate of professional aptitude

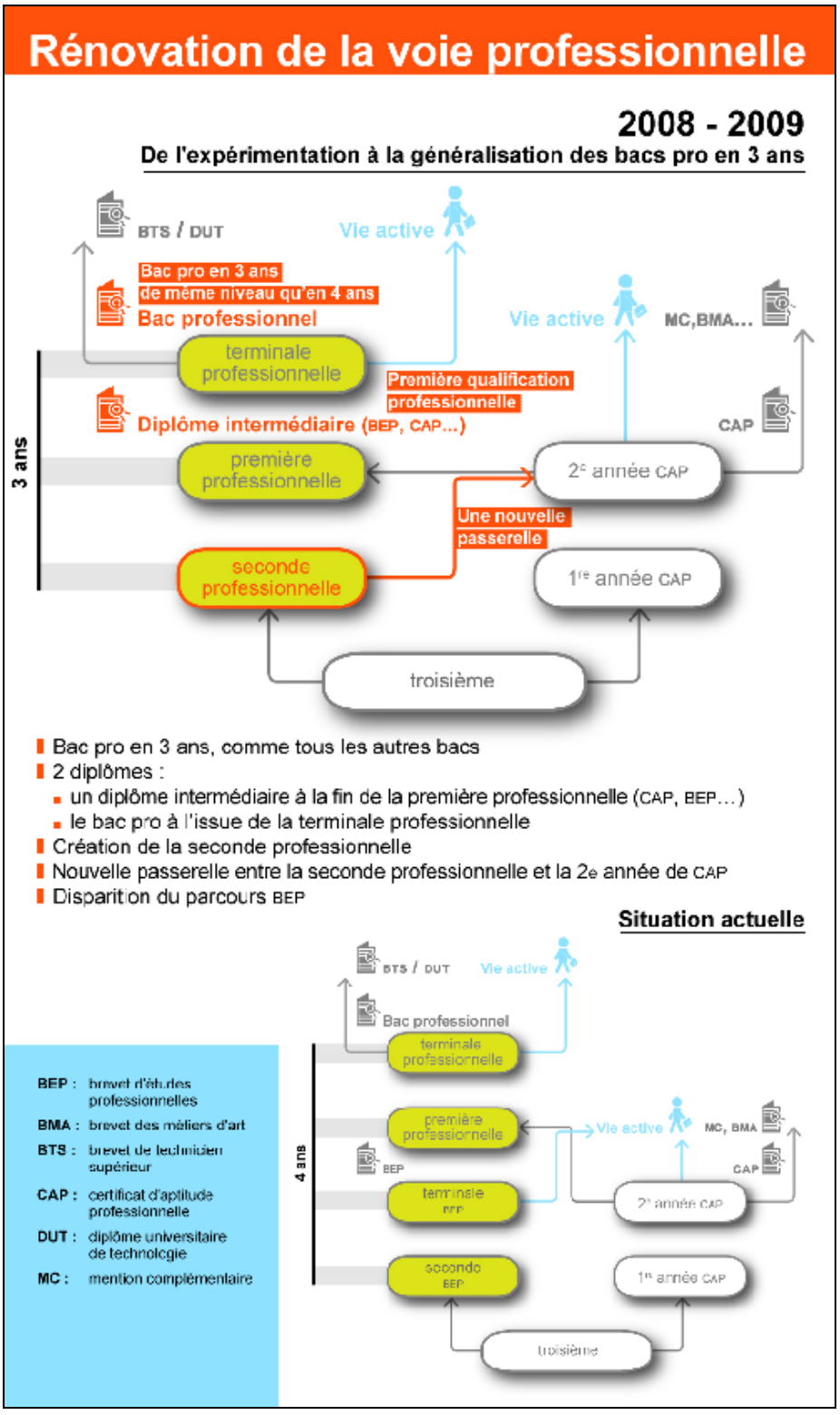
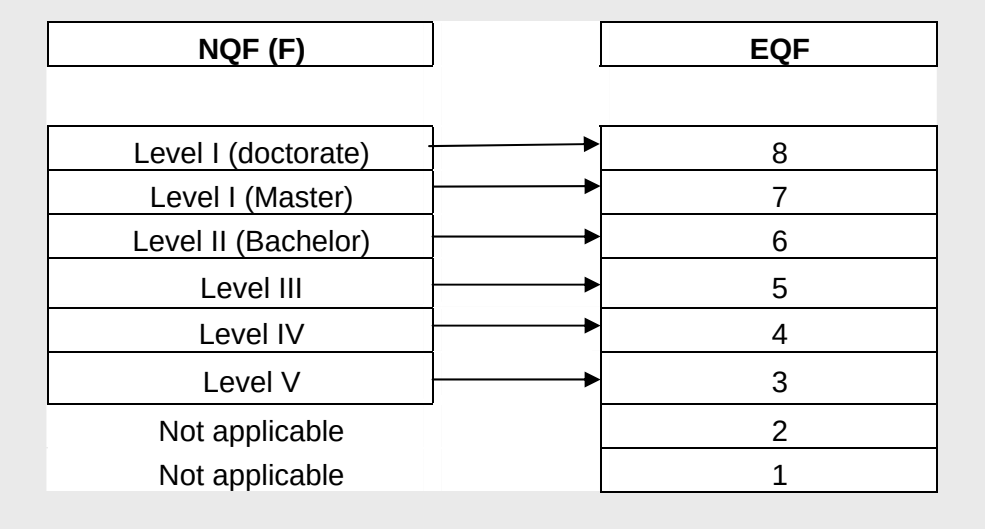


Fig. 1: The new French system

Since 1969 the French NQF is organised in five levels, which are arranged in reverse order compared to the European Qualifications Framework. The latest documents from the national working group responsible for the referencing of the two frameworks show the following correspondence[8] in Table 1.



NQF (F)	EQF
Level I (doctorate)	8
Level I (Master)	7
Level II (Bachelor)	6
Level III	5
Level IV	4
Level V	3
Not applicable	2
Not applicable	1

Tab. 1: Draft referencing of the French NQF to the EQF

The system is designed in such a way that formal transition points exist for moving (vertically) from one level to another but also (horizontally) within one level. In order to allow for a validation of experiential learning (Validation des Acquis de l'Expérience – VAE) all qualifications in the NQF were divided into certification units. The purpose of these units is the attainment of the full qualification, which can take place at once or progressively. It can be expected that these existing units, which are still relatively large, might be further divided in a way similar to ECVET. This, however, remains to be checked and the outcome of this process is unpredictable at the moment. The experience of the AEROVET project suggests that it will be possible to develop learning units rather than certification units. The referencing of the AEROVET qualifications to the French NQF is as follows:

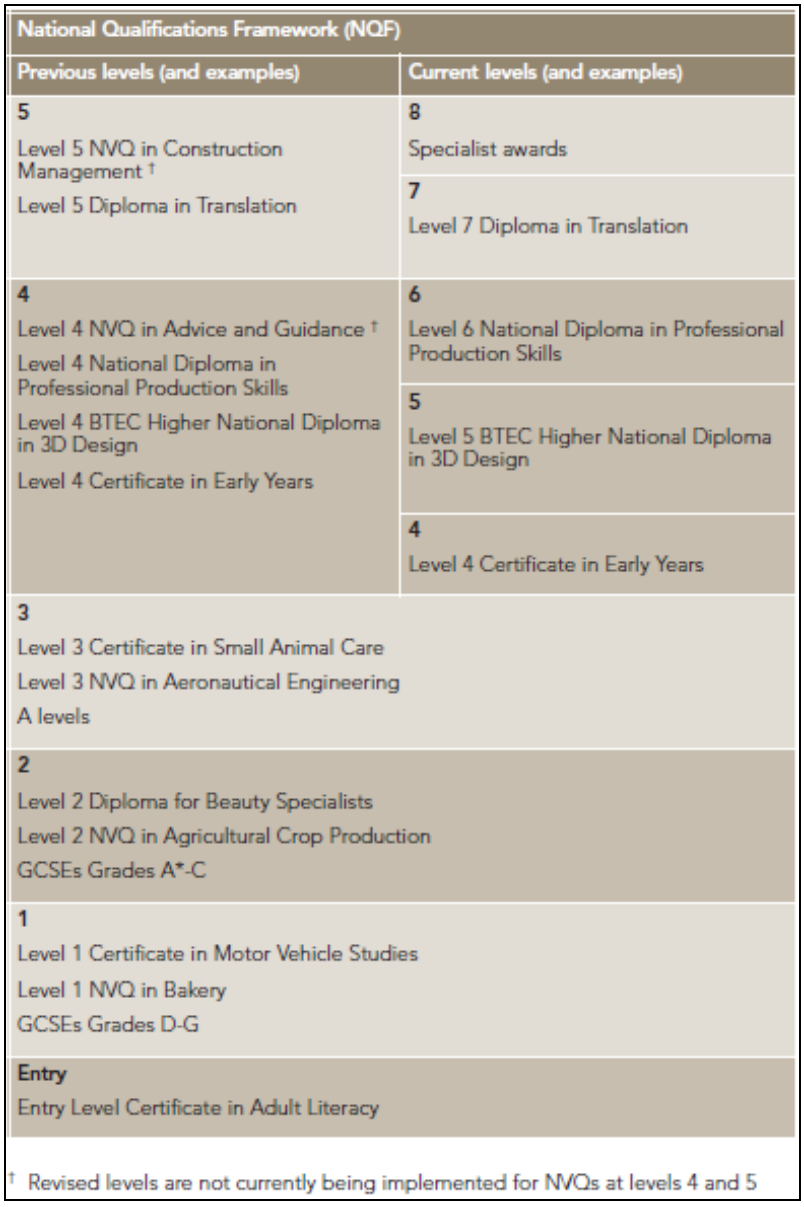
Mechanics Cell Systems (*Bac Pro Mécanicien Système Cellule)*	NQF (F): IV EQF 4
Technician in Aerostructure *(Bac Pro Technicien Aérostructure*	NQF (F): IV EQF 4
Mechanics avionic system *(Bac Pro Mécanicien Système Avionique*	NQF (F): IV EQF 4
Electrician Aeronautic System *(CAP Electricien Système d'aéronefs)*	NQF (F): V EQF 3
CAP mécanicien cellules d'aéronefs	NQF (F): V EQF 3

Tab. 2: French qualifications of the project in the NQF (F)

[8] CNCP, Groupe de travail français du project « Referencing of the French National Framework of Qualifications (NFQ) to the European Qualifications Framework for Lifelong Learning », June 2010

B: United Kingdom

The NQF for England, Wales and Northern Ireland was revised in 2006. The number of levels increased from 6 to 9 (entry level to level 8). The entry level and the levels 1-3 did not change. The qualifications of the higher levels (levels 4 and 5 of the old NQF) were allocated more precisely to the levels 4-8 of the new NQF: see figure 2.



National Qualifications Framework (NQF)	
Previous levels (and examples)	**Current levels (and examples)**
5 Level 5 NVQ in Construction Management † Level 5 Diploma in Translation	**8** Specialist awards
	7 Level 7 Diploma in Translation
4 Level 4 NVQ in Advice and Guidance † Level 4 National Diploma in Professional Production Skills Level 4 BTEC Higher National Diploma in 3D Design Level 4 Certificate in Early Years	**6** Level 6 National Diploma in Professional Production Skills
	5 Level 5 BTEC Higher National Diploma in 3D Design
	4 Level 4 Certificate in Early Years
3 Level 3 Certificate in Small Animal Care Level 3 NVQ in Aeronautical Engineering A levels	
2 Level 2 Diploma for Beauty Specialists Level 2 NVQ in Agricultural Crop Production GCSEs Grades A*-C	
1 Level 1 Certificate in Motor Vehicle Studies Level 1 NVQ in Bakery GCSEs Grades D-G	
Entry Entry Level Certificate in Adult Literacy	

† Revised levels are not currently being implemented for NVQs at levels 4 and 5

Fig. 2: The modified NQF (UK)

Subsequently, the intention to create a NQF containing all significant qualifications has itself been superseded and alongside the NQF there is now a Qualifications and Credit Framework (QCF) which contains a much fuller range of vocational (or work-related) qualifications, available in England, Wales and Northern Ireland. These qualifications are no longer specified solely in terms of learning outcomes as learning processes are now acknowledged as significant and inputs in the form of ‘learning volume‘,

represented by notional learning hours have been reintroduced. For an idea of how the NQF and the QCF map against each other, see figure 3.

Level	Examples of NQF qualifications	Examples of QCF qualifications
Entry	- Entry level certificates - English for Speakers of Other Languages (ESOL) - Skills for Life - Functional Skills at entry level (English, maths and ICT)	- Awards, Certificates, and Diplomas at entry level - Foundation Learning at entry level - Functional Skills at entry level
1	- GCSEs grades D-G - BTEC Introductory Diplomas and Certificates - OCR Nationals - Key Skills at level 1 - Skills for Life - Functional Skills at level 1	- BTEC Awards, Certificates, and Diplomas at level 1 - Functional Skills at level 1 - Foundation Learning Tier pathways - NVQs at level 1
2	- GCSEs grades A*-C - Key Skills level 2 - Skills for Life - Functional Skills at level 2	- BTEC Awards, Certificates, and Diplomas at level 2 - Functional Skills at level 2 - OCR Nationals - NVQs at level 2
3	- A levels - GCE in applied subjects - International Baccalaureate - Key Skills level 3	- BTEC Awards, Certificates, and Diplomas at level 3 - BTEC Nationals - OCR Nationals - NVQs at level 3
4	- Certificates of Higher Education	- BTEC Professional Diplomas Certificates and Awards - HNCs - NVQs at level 4
5	- HNCs and HNDs - Other higher diplomas	- HNDs - BTEC Professional Diplomas, Certificates and Awards
6	- National Diploma in Professional Production Skills - BTEC Advanced Professional Diplomas, Certificates and Awards	- BTEC Advanced Professional Diplomas, Certificates and Awards
7	- Diploma in Translation - BTEC Advanced Professional Diplomas, Certificates and Awards	- BTEC Advanced Professional Diplomas, Certificates and Awards - NVQs at level 5 (in the QCF framework)
8	- specialist awards	- Award, Certificate and Diploma in strategic direction

Fig. 3: Qualifications by level across the NQF and QCF

In England and Wales the qualifications that are concerned with the AEROVET project are located at the national level 3. Unlike their French counterparts, the UK levels are unambiguously referenced to the EQF; the levels (except the entry level) directly

correspond to each other, which means that the qualifications in question are also at EQF level 3.

Another difference to France is rooted in the modularised UK system. Not only qualifications, but also the NVQ units are allocated to the levels of the NQF and QCF (see table 3). These units usually do not correspond directly to the AEROVET units. For instance, unit 11 (quality tests) is assigned to level 4 in the British system (cf. section 3).

Aeronautical engineering level 3; aircraft manufacture mechanical pathway	NQF / QCF (EWNI) 3 EQF 3
Aeronautical engineering level 3; aircraft manufacture electrical pathway	NQF / QCF (EWNI) 3 EQF 3
Aeronautical engineering level 3; aircraft maintenance pathway	NQF / QCF (EWNI) 3 EQF 3

Tab. 3: Selected qualifications relevant for the project mapped against levels of the NQF / QCF / EQF

C: Spain

Within the overall education system in Spain, vocational education offers various modularised training programmes of varying duration. The theoretical and practical contents relate to various professional environments. The courses are school-based with work placements being organised as specific modules. The Spanish VET system includes three levels:

- initial level (iniciación profesional)
- medium level (grado medio) and
- higher level (gvrado superior).

The Spanish qualifications system is organised in 26 professional 'families'. The qualifications that are relevant here belong to family 12:

12. Transport and Vehicle Maintenance

(Transport und Instandhaltung von selbstbetriebenen Fahrzeugen)

Transporte y Mantenimiento de Vehículos Autopropulsados

The Spanish qualifications system has a high degree of modularisation and is therefore highly flexible in principle. Modularisation is not only a characteristic of the courses, but also influences the very definition of vocational qualifications, which are structured in units of competence. The latter are defined as the smallest competence 'bundles' that can be recognised, assessed and accredited.

All modules are listed in the catalogue of VET modules (Catálogo Modular de Formación profesional). This catalogue contains more than 1,300 modules. The modules are coherent blocks that are linked to a competence unit and described in terms of skills, educational contents and assessment criteria. "*Las capacidades son la expresión de los resultados esperados. A cada capacidad le corresponde un conjunto de criterios de evaluación que delimitan el alcance, el nivel y el contexto en el que va a ser evaluada la capacidad*." (INCUAL: Sistema Nacional de Cualificaciones y Formación Profesional: 8)

All qualifications are assigned to the levels of the Spanish qualifications system (SQS), which consists of 5 levels and uses only the notion of competence as the basis of its classifications. It is quite obvious that the levels of the Spanish qualifications system do not correspond to those of the EQF. De facto the levels 1 and 8 do not exist in the Spanish system. The Spanish level 2 corresponds to EQF level 3 and in part to EQF level 4. In several studies INCUAL established the relations between the levels of the Spanish qualifications system and those of the EQF. The resulting picture is as follows (see table 4):

Level correspondence between the Spanish qualifications system and the EQF		
Qualifications of the Spanish system	EQF level	SQS level
Medium-level technician	4	2
Higher-level technician	5	3
University degree: Bachelor	6	4
University degree: Master	7	4-5
University degree: doctorate	8	5

Tab. 4: Correspondence between the Spanish NQF and the EQF

Qualifications of the aerospace industry in the SQS and the EQF

In the Spanish qualifications system there is no occupational title for the aerospace industry at the level of medium-level technicians, but there are at least modules at the Spanish levels 1 and 2 of an accordingly short duration. All occupational titles and training modules in the aerospace sector belong to the occupational family “Transport and Vehicle Maintenance”, which comprises a total of 29 modules, out of which 8 are associated with the aerospace industry (see Table 5). One module is located at level 1, another at level 2 and the other six at level 3.

At the level of higher-level technicians, that is, at level 3 of the Spanish system and level 5 of the EQF, there are one occupational title for the automotive sector and the following two titles for the aerospace sector:

- Higher-level technician for maintenance in the area of avionics
- Higher-level technician for maintenance in the area of aircraft machinery

The access to this higher cycle of vocational education and training requires a Bachillerato (the Spanish university entrance qualification) or an equivalent certificate, a vocational qualification at the second level of the VET system, a university degree or an equivalent degree. Applicants who do not have the required qualification have the opportunity to take an admission test, provided they are over 20 years old or in possession of an occupational title from the same occupational family and above 18 years of age (see Guia). These two qualifications are associated with the Bachillerato in the area of natural and health sciences.

Spanish VET modules and occupational titles for the aerospace industry by SQS and EQF levels		
	SQS	**EQF**
VET modules		
Operaciones auxiliares de mantenimiento aeronáutica	1	2
Mantenimiento general de los sistemas, motor y estructuras de aeronaves	2	4
Mantenimiento de equipos, componentes y elementos de aeronaves en taller	3	5
Mantenimiento de estructuras de aeronaves	3	5
Mantenimiento de los sistemas de aeronaves	3	5
Mantenimiento de los sistemas eléctricos y de la aviónica de los sistemas mecánicos de la aeronave	3	5
Mantenimiento de motores de turbina de aeronaves	3	5
Mantenimiento de sistemas de aviónica de aeronaves	3	5
Occupational titles		
Técnico superior de mantenimiento aviónico	*3*	*5*
Técnico superior de mantenimiento areomecánica	*3*	*5*

Tab. 5: The Spanish modules and qualifications in the Spanish NQF and the EQF

D: Germany

In March 2011, Germany adopted a national qualifications framework (the DQR), being the last of the AEROVET partner countries to do so. Following a phase of intensive discussions between the stakeholders from the different educational sectors (vocational, general and higher education), representatives of the federal government, the Länder and the social partners achieved a compromise on 31.01.2012 with regard to the level assignment.

According to the compromise, general education degrees will not be aligned with the framework for the time being. It was also decided to assign two-year initial VET courses to level 3 and three- and three-and-a-half year initial VET courses [including those relevant for AEROVET] to level 4.

(see http://www.deutschergualifikationsrahmen.de/de/aktuelles/-der-weg-f%C3%BCr-die-einf%C3%BChrung-des-deutschen-qualifika_gq21oohc.html).

The decision provides for an eight-level framework which includes vocational qualifications as well as higher education degrees. In contrast to the three descriptors of the EQF (knowledge, skills, competences) the DQR draws a distinction between two descriptors, each of which is subdivided into two subcategories: professional competence (knowledge, skills) and personal competence (social competence, autonomy). For this reason it is by no means necessary that the national levels will correspond directly to those of the EQF (unlike the situation in the UK) and no such decision has been made yet (the referencing is scheduled for the second half of 2012). For the purposes of the AEROVET project it is assumed that the high-technology qualifications that are considered here will be allocated to level 4 of the EQF as well. With these reservations the following statement can be made for Germany (see table 6):

Fluggerätmechaniker (FGM) Fachrichtung (FR) Fertigung & FR Instandhaltung	NQF (DE): level 4 EQF: possibly level 4
Elektroniker für luftfahrt-technische Systeme (ELS)	NQF (DE): level 4 EQF: possibly level 4

Tab. 6: Possible positioning of qualifications in the German NQF

3. Comparison of the learning units with the qualifications

A: France

As already described in the previous section the French VET system was characterised by a strict horizontal division that also affected the qualifications in the aeronautics sector. A two-year basic vocational training (BEP or CAP) was followed by an optional phase of another two years (Bac Pro), which also included the attainment of a university entrance qualification. This division in the hierarchy of vocational qualifications also affects the learning outcomes. The basic and less sophisticated learning outcomes are associated with the CAP while the more complex ones belong to the Bac Pro (see Table 7). This second phase was reduced to 1 year in order to adjust the time required for obtaining a university entrance qualification in the vocational track to the 3 years of the academic track. Curricular adjustments have not been made yet. However, a reorganisation was initiated to the effect that in the new model the CAP will be “only” an intermediate certificate for 90% of the students, a proportion targeted for political reasons.

Name of qualification	LU covered completely or to a large extent	Approximate coverage of curricula by the LU in %	Duration
Systems mechanic (*Bac Pro Mécanicien Système* cellules*)*	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	80%	3 years, including 22 weeks in the workplace (incl. CAP MEC)
Structural mechanic *(Bac Pro Technicien Aérostructure)*	1, 2, 3, 4, 5, 6, 7, 9, 10, 11	80%	3 years, including 22 weeks in the workplace (incl. CAP MEC)
Avionics technician *(Bac Pro Mécanicien Système Avionique)*	11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22	80%	3 years, including 22 weeks in the workplace (incl. CAP EL)
CAP Electricien Système d’aéronefs	12, 13, 14, 19	80%	2 years
CAP mécanicien cellules d’aéronefs	1, 2, 3, 4	80%	2 years

Tab. 7: Relation of the Learning Units (LU) to the French qualifications

B: United Kingdom

In the United Kingdom the development of VET in the sector shows that the choice of NVQ units has considerably expanded in recent years. For instance, one college offers the following programme for the first two years of an aircraft maintenance higher apprenticeship (see table 8):

Year 1 Units – Core Units	**Year 2 Units – Mechanical Maintenance Pathway**
Unit 1 – Aviation Maths & Science	Unit 7 – Aircraft materials and hardware
Unit 2 – Electrical & Avionics Fundamentals	Unit 8 – Aircraft Structure and Maintenance
Unit 3 – Aviation Legislation	Unit 9 – Aircraft Mechanical Systems
Unit 5 – Basic Aerodynamics	Unit 10 – Gas Turbine Engines & Propellers
Unit 6 – Human Factors	

Tab. 8: Units of the first two years of a college training programme

The “Edexcel Level 3 BTEC Extended Diploma in Aircraft Maintenance”, on the other hand, consists of only 4 mandatory units (50 points) and additional optional units with 130 points. In total this is equal to 1080 “guided learning hours” (GLH) for the entire qualification.
This structure also allows for the import of “standard BTEC units (QCF) at Levels 2, 3 or 4” with a view to meeting local demands. The volume of these imported units is limited to a maximum of 30 points and must not take place at the expense of the mandatory units.

Mandatory Units *Credit: Minimum 50.*

- A/600/7123 - Theory of Flight
- K/600/7196 - Aircraft Workshop Principles and Practice
- A/600/7199 - Aircraft Materials and Hardware
- R/600/7239 - Human Factors in Aircraft Engineering

Optional Units *Credit Minimum 130.*

- J/600/0255 - Electrical and Electronic Principles
- M/600/7183 - Principles and Applications of Aircraft Mechanical Science
- R/600/7189 - Principles and Applications of Aircraft Physical Science
- A/600/7204 - Inspection and Repair of Airframe Components and Structures
- L/600/7174 - Aircraft Maintenance Practices
- L/600/7210 - Aircraft Electrical Machines
- D/600/7213 - Aircraft Electrical Devices and Circuits
- T/600/7217 - Aircraft Electronic Devices and Circuits

- A/600/7235 - Aircraft Computers and Electronic Systems
- H/600/7245 - Aviation Legislation
- M/600/7250 - Airframe Structural Concepts and Construction Methods
- J/600/7254 - Aircraft Hydraulic Systems
- H/600/7259 - Aircraft Propulsion Systems
- M/600/7264 - Airframe Systems
- J/600/7271 - Aircraft Gas Turbine Engines
- H/600/7276 - Aircraft Electrical Systems
- K/600/7280 - Aircraft Instruments and Indicating Systems
- F/600/7303 - Aircraft Gas Turbine Engine and Propeller Maintenance
- Y/600/7307 - Avionic Systems
- D/600/7311 - Aircraft Radio and Radar Principles
- Y/600/7324 - Further Aircraft Electronic Circuits and Avionic Systems
- M/600/7345 - Helicopter Gas Turbine Engines, Transmission, Rotors and Structures
- A/600/7347 - Principles of Helicopter Flight and Aerodynamics
- R/600/9069 - Mathematics for Aircraft Maintenance
- J/600/9070 - Aircraft Explosive Devices and Regulations
- L/600/9071 - Operation and Maintenance of Aircraft Weapons Electrical Systems
- M/600/9077 - Operation and Maintenance of Aircraft Assisted Escape Systems

All the Typical Professional Tasks (TPTs) are covered within the suite of qualifications but how much coverage any particular individual has will depend on the choices made and the organisation of work. For this reason the information in table 9 is valid only for selected programmes and not for the UK system in general.

Name of qualification	LU covered completely or to a large extent	Approximate coverage of curricula by the LU in %	Duration
Aeronautical engineering level 3; aircraft manufacture mechanical pathway	1 2 4	30%	24 – 36 months within a 48-month programme
Aeronautical engineering level 3; aircraft manufacture electrical pathway	12 13 14	30%	24 – 36 months within a 48-month programme
Aeronautical engineering level 3; aircraft maintenance pathway	3 5 6 7 8 9 10 15 16 17 18 19 20 21 22	75%	24 – 36 months within a 48-month programme

Tab. 9: Relation of the LU to selected UK qualifications

C: Spain

A detailed comparison of the two selected Spanish VET qualifications in aircraft maintenance with the learning units developed in the project shows that the latter can be regarded as relevant for the curriculum in spite of the fact that their approach is fundamentally different from the Spanish curriculum development procedure. The experts interviewed agreed that the learning units related to manufacturing had little relevance while a large number of the units in the area of mechanics were useful for the qualification of higher-level technicians for maintenance in aircraft machinery (see table 10). Similarly, many learning units in the area of electronics could be used for the training of higher-level technicians for maintenance in the field of avionics. The transversal unit 11 also corresponds to parts of the curriculum.

Name of qualification	LU covered completely or to a large extent	Approximate coverage of curricula by the LU in %	Duration
Higher-level technician for maintenance in the area of aircraft machinery	6, 7, 8, 9 10, 11, 17, 19,	30%	Minimum: 2000 h
Higher-level technician for maintenance in the area of avionics	10, 11, 16, 17, 18, 19, 20, 21, 22	30%	Minimum: 2000 h

Tab. 10: Relation of the LU to the Spanish qualifications

It became clear, especially in the Spanish context, that a partial correspondence of written contents as well as formulations does not necessarily mean identical learning outcomes. Especially when it comes to knowledge, the available learning outcomes are broader and deeper than in courses offered in countries where the qualifications in question are situated at a lower level.

D: Germany

The strongest agreement of the learning units with the national curricula was found in Germany. Not only do the contents of all learning units appear in the curricula (aircraft mechanic with the specialisations 'maintenance technology' and 'manufacturing technology'), which is unparalleled in the other 3 countries (see also 6_AP_2_Abgleich_FGM and 7_AP2_Abgleich_ELS). The coverage is also the highest of all four countries. The learning units include approximately 80% of the curricula. As regards the modules that make up the curricula, only the modules 1 (vocational education, labour legislation and collective agreements) and 2 (structure and organisation of training) are explicitly distinct from the learning units. The other modules are either implicitly included in the learning units (modules 3-6) or nearly correspond to the latter: for instance, module 16 of the aircraft mechanic programme (assembly and disassembly of components) and learning unit 4 (fitting and removing structural components in aircraft bodies) (see table 11). At the vocational school the coverage is lower; substantial parts of the curricula are not covered, the most important deficit in the case of aircraft mechanics being the areas of aerodynamics and helicopters.

Name of qualification	LU covered completely or to a large extent	Approximate coverage of curricula by the LE in %	Duration
Fluggerätmechaniker FR Fertigung &Instandhaltung	1-11	80 %	standard: 42 months, optional: 36 months
Elektroniker für luftfahrt-technische Systeme	11-22	80 %	standard: 42 months, optional: 36 months

Tab. 11: Relation of the LU to the German qualifications

A reorganisation of the training programmes is scheduled not only in France but also in Germany. The basis of this reorganisation will be the learning units validated in the AEROVET project (termed "competence areas" in the German context); the most important policy papers of the German social partners are annexed to this report (10-12). The programmatic "Memorandum of Understanding" is given also as an English translation because of its relevance for the further development of ECVET (cf. WP7) while the technical specifications, which explicitly refer to the AEROVET learning unit, are presented only in German.

4. Conclusion and outlook

Although only four out of 27 EU countries participated in the AEROVET project, the referencing of the national qualifications in the sector to the EQF exhibits a surprising variety. While Spain does not have a qualification profile in manufacturing (cf. AERONET) and workers are only trained for single work tasks (which would correspond to levels 1 or 2 of the EQF), the relevant qualifications in the United Kingdom are assigned to level 3. The German and French qualifications in the sector will (probably) be referenced to level 4 of the EQF. Finally, in the maintenance sector in Spain there is “only” a level 5 qualification.

An overview of the relations of the different national qualifications to the learning units and to the EQF is given in Table 12:

Summary				
Name of qualification	LU covered completely or to a large extent	NQF/EQF level	Approximate coverage of curricula by the LU in %	Duration
Germany				
Fluggerätmechaniker FR Fertigung & Instandhaltung	1-11	NQF: 4 EQF: possibly 4	80 %	standard: 42 months, optional: 36 months
Elektroniker für luftfahrt-technische Systeme	11-22	NQF: 4 EQF: possibly 4	80 %	standard: 42 months, optional: 36 months
France				
(*Bac Pro Mécanicien Système* cellules*)*	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	NQF: 4 EQF: 4	80 %	3 years, including 22 weeks in the workplace
(Bac Pro Technicien Aérostructure)	1, 2, 3, 4, 5, 6, 7, 9, 10, 11	NQF: 4 EQF: 4	80 %	3 years, including 22 weeks in the workplace
(Bac Pro Mécanicien Système Avionique)	11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22	NQF: 4 EQF: 4	80 %	3 years, including 22 weeks in the workplace
(CAP Electricien Système d'aéronefs*)*	12, 13, 14, 19	NQF: 5 EQF: 3	80 %	2 years
CAP mécanicien cellules d'aéronefs	1, 2, 3, 4	NQF: 5 EQF: 3	80 %	2 years
United Kingdom				
Aeronautical engineering level 3; aircraft manufacture mechanical pathway	1 2 4	NQF 3 EQF 3	30%	24 – 36 months within a 48-month programme
Aeronautical engineering level 3; aircraft manufacture electrical pathway	12 13 14	NQF 3 EQF 3	30%	24 – 36 months within a 48-month programme
Aeronautical engineering level 3; aircraft maintenance pathway	3 5 6 7 8 9 10 15 16 17 18 19 20 21 22	NQF 3 EQF 3	75%	24 – 36 months within a 48-month programme
Spain				
Higher-level technician for maintenance in the area of aircraft machinery	6, 7, 8, 9 10, 11, 17, 19,	NQF 3 EQF 5	30%	Minimum: 2000 h
Higher-level technician for maintenance in the area of avionics	10, 11, 16, 17, 18, 19, 20, 21, 22	NQF 3 EQF 5	30%	Minimum: 2000 h

Tab. 12: Overview: results of work package 3

The question as to whether learning units on the basis of professional work tasks are useful in the context of transnational mobility projects could be answered in the affirmative despite these differences with regard to the level of training programmes. Most of the learning units are included, mutatis mutandis, in the national curricula in question and are also part of the training practice. The different coverage of the curricula is essentially due to two reasons:

- The curricula include national particulars (e.g. labour legislation), which are irrelevant for the recognition of learning outcomes in the context of transnational mobility.
- In some cases the learning units, all of which are based on professional work tasks, can be fully learned only at the real aircraft. As not all training providers have flight hardware at their disposal, the curricula sometimes emphasise basic skills and comprehensive knowledge instead.

Apart from considerations of time (see below), this outcome suggests that there should also be mobility units (MU) that would be partially independent of the learning venue. For instance, in learning unit 7 (maintenance and inspection of aircraft) diagnostics can be learned only at the flight hardware whereas the maintenance of pistons etc. can be learned in any workshop. These situations where a learning unit can be successfully completed (in spite of local limitations) with the help of mobility phases exemplify a particular asset of ECVET: the opportunity to acquire additional certificates which testify learning outcomes that are not attainable in the national context.

The aspect of the relative weight of the learning units in terms of ECVET points has not been decided in this work package, and the partners and experts hold the view that this is not possible at this level of abstraction. A valid estimation is possible only for the relative weight of the units within a concrete programme but not for their weight in relation to each other.

This conclusion is justified by the following research findings:

- In the United Kingdom, the learning units are part of numerous qualifications that are highly different in scope (the qualifications listed in Table 8 are the most frequent ones); the relative weight of the units depends directly on the volume of the qualification.
- The Spanish colleagues pointed out that the different levels of qualifications in the EQF influence the depth and the theoretical contents of learning outcomes. For example, 5% of the qualification of a level 5 technician from Spain is not equal to 5% of the qualification of a British skilled worker at level 3.
- Even the technological, input-oriented approach of the EASA (see AP_5) takes this result into account and provides that the modules and sub-modules may be taken at three different levels. In the EASA approach this differentiation is reflected by the different durations of the learning units.

- The German VET system operates with minima instead of rigid benchmarks. The curricula describe “time frames”, e.g. training phases have a duration of “2 to 4 months” or between 5 and 10% of the learning hours. This openness for variation is due to the specific business areas of the training enterprises. For instance, the experts from EADS Manching (maintenance of military aircraft) attribute a much greater relevance to the units 18 and 21 (inspection or, respectively, repair of information and communication systems) than their colleagues from Atlas Air Service Bremen (maintenance of private and small business aircraft) do.

Apart from the pragmatic approach to defining points in the context of concrete mobility projects, the consortium firmly recommends a revision of the relevant parts of the ECVET technical specifications. We are concerned that in the long run the commitment of specialised enterprises to training within dual systems will be reduced if this approach is uncritically adopted.

The mobility certificates developed in work package 4 include a coherent description of the learning units as well as mobility units (MU) as integral parts of the learning units. This is due to the project’s embeddedness in the context of transnational mobility. In reality it cannot be expected that an entire learning unit can be completed in the course of a mobility phase. First, there is no guarantee that the ***learning opportunities*** at the hosting institution (especially in non-modularised systems like France and Germany) always match a unit during a mobility phase. Second, many mobility phases are simply ***too short*** to allow for the acquisition of a complete learning unit.

An explicit and desirable aim of ECVET is to avoid the repeated assessment of identical learning outcomes. The AEROVET project developed a two-step procedure for this purpose. The learning outcomes of the single mobility units are estimated on a qualitative performance-oriented scale by the tutors at the hosting institution. The actual assessment of the learning outcomes related to a unit takes place only after the completion of the relevant mobility units.

This proposal is based on two outcomes of the workshops with training providers that already had some experience with the mobility and exchange of VET students:

- The argument of time: It has to be considered once more that the young people stay in an unfamiliar learning environment (in terms of language and culture) only for a couple of weeks, and that the mobility instruments are supposed to be usable beyond those arrangements that are specifically related to ECVET. It would contradict all practical experience if a learning unit (and a mobility unit, too) could be learned “from scratch” during those phases. Given the high quality standards in the sector, one would have to worry that a tutor in a hosting institution would accept only in rare exceptional cases (no matter what assessment methods might apply) to sign an authoritative certification of the learning success after just a few weeks. Moreover, such a yes-or-no approach would undermine the important aim

of avoiding unnecessary repetitions. The tutors in the home institution would have no clue which prior knowledge, skills and competences could be presupposed in further teaching.

- Even more important is the pedagogical argument, according to which many learning outcomes of the sector ***cannot*** be acquired within one learning phase (be it with or without mobility activities). Even the mastery of a seemingly simple ability like “riveting” requires several longer periods of exercise in variable settings. Therefore the mobility certificates include, in addition to the phased performance scale, several lines for testifying learning loops that are ***necessary*** from a pedagogical point of view.

The partners hold the view that a testing of ECVET in the context of transnational mobility makes sense and is feasible beyond an experimental phase only if the learning units are based on mobility units (MU) with a phased certification. The National Agency at the BIBB subscribed to the second part of this analysis in the autumn of 2009 when the phased qualitative performance-oriented assessment which had been proposed in the AEROVET project was adopted as a recommendation for projects under the ECVET priority of the National Agency.