

Key Skills and Competences for Defence

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Annex C

Lucia Retter, Louise Taggart and Jon Freeman

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Annex C - Education Courses for Key Skills and Competences

This Annex accompanies Chapter 3 and provides an overview of some of the European-wide course and programmes which promote skills for defence and/or represent examples of ‘communities of expertise’ fostering training in specific defence and security areas (see Chapter 5, section 5.2 for more detail on communities of expertise). Many of these courses are EU-sponsored or involve the participation of Member States’ governments, meaning that the qualifications and certifications they offer will have a greater degree of recognition across Europe. Some agencies, such as ENtri (Europe’s New Training Initiative for Civilian Crisis Management), act as accreditation bodies themselves. Others use the ECTS (European Credit Transfer and Accumulation System) to facilitate an exchange of participants across member states, such as Emilyo, an exchange programme for young military officers.

This annex also provides examples of defence-specific education programmes that are available across Europe.

1.1. European-wide programmes for defence skills

1.1.1. European Initiative for Advanced Training in Aerospace (ECATA)¹

ECATA provides customised short courses for Aerospace Business Integration covering a range of topics across the aerospace industry, such as sustainability, lean manufacturing, supply chain, maintenance, risk accounting and software services. ECATA courses are developed by leading aerospace companies and academic institutions across Europe and are delivered across various locations in the EU. ECATA also participates in exchange programme Erasmus Mundus.

1.1.2. EU Security and Defence College

The European Security and Defence College (ESDC) provides strategic-level education in European Security and Defence Policy, now Common Security and Defence Policy (CSDP). Although there is no mechanism for transferability and accreditation, ESDC courses are designed by the governments of member states which facilitates their recognition. The ESDC also issues a certificate upon completion of the course that is recognised by EU member states members of ESDC but is not tied to an external accreditation or recognition mechanism.

¹ See for example ECATA (2010; n.d.).

Course curricula undergo an internal quality assurance review by experts as well as by the executive academic and board of the ESDC. The guidelines for the evaluation of CSDP courses organised by the European Security and Defence College refer to content evaluation and does not reference evaluation transferability.²

The ESDC runs a series of courses of relevance to defence and security, including specialised training activities on security sector reform. It is closely linked to national network institutes, relevant EU institutions and agencies, and external training actors.³ In 2011, 50 training institutes from all member states, including policy academies, were actively engaged in conducting ESDC training activities.⁴ The EU training policy in CSDP is implemented by Member States' training providers on a national basis or through EU-level training providers/projects.

1.1.3. CEPOL (European Police College)

The college promotes defence skills through residential activities, online learning and European policy exchange programme. CEPOL teaches courses including counter-terrorism, special law enforcement techniques and police cycle activities. CEPOL provides recommendations about police training on specific subjects with a European dimension. These recommendations are issued on topics such as counter terrorism, Europol, police ethics and prevention of corruption, domestic violence, money laundering, trafficking in human beings, civilian crisis management and drug trafficking.⁵

1.1.4. ENTRi (Europe's New Training Initiative for Civilian Crisis Management)

ENTRi provides training and guidelines for civilian experts working in crisis management and acts as a certification authority for such training courses. ENTRi awards a label (C3MC) to courses that meet established standards and criteria for civilian personnel to be deployed to crisis management missions. This allows courses to align with international standards, which are recognised by organisations and professionals at the European level.⁶ In order to obtain an ENTRi label, course organisers need to fill in an online application, reviewed by the ENTRi certification working group. The renewable certification is valid for three years. Those courses with a valid certification are listed online.⁷

1.1.5. EUPST (European Union Police Services Training)

EUPST aims to contribute to the strengthening of civilian capabilities in order to support stabilisation efforts in countries emerging from a situation of political crisis. Partner organisations include relevant

² European Security and Defence College (2008).

³ See: Europa.eu (2008); Rehr and Weisserth (2013: 104-118).

⁴ Council of the European Union (2011:5).

⁵ CEPOL (2015).

⁶ ENTRi (2013).

⁷ ENTRi (n.d.).

public authorities in France, Italy, the Netherlands, Romania and Spain, as well as the European police College CEPOL.

1.1.6. Emilyo

Emilyo is an exchange programme for military officers, and the courses allow participants to obtain credits as part of the European Credit Transfer System (ECTS) which can be used as part of their national qualifications.⁸

1.1.7. International Military Academic Forum

The International Military Academic Forum provides an exchange for young officers, inspired by the Erasmus programme. An agreement between partner organisations ensures that the courses will be recognised across participating organisations.⁹

Other courses of relevance include:

- **European Naval Academies:** European naval academies provide exchange opportunities for naval officers on courses across various national academies.¹⁰
- **European Air Force academies**¹¹ is a forum of experts aiming to exchange information, cooperate and identify areas of common interest to carry out activities, with the largest possible participation of all the member nations, in the field of officer education and training.
- **The European Defence Agency** sponsors training activities, including European Air Refuelling, European Air Transport, the European Armament Cooperation (EAC) Course, European Advanced Airlift Tactics and Helicopter training programmes.¹²

⁸ European Security and Defence College (2013:9); European Initiative for Exchange of Military Young Officers (n.d.).

⁹ iMAF (2014).

¹⁰ See European Naval Academies (2013; 2014).

¹¹ European Air Force Academies (n.d.).

¹² EDA (2014c).

1.2. Examples of defence-specific education programmes in the EU for specialised defence skills and competences

Table C.1. Air - Design, Engineering and Manufacture

Functional competence	Occupation	Example of course	Awarding institution	Specialised module
Design	Design engineer	MSc, Design Engineering	Delft University of Technology (NE)	
Design	Detail and installation designer	BSc, MSc, Aerospace Engineering	Warsaw University of Technology (PO)	Machine Design and Maintenance
Systems engineering and design	Low-observability engineer	BSc, Engineering Science, focus on Defence Technology	Helmut Schmidt University, University of the Federal Armed Forces (DE)	Corrosion, Failure Analysis and Prevention
Systems engineering and design	Interoperability engineer	MSc, Diplôme d'ingénieur ISAE-SUPAERO	Higher Institute of Aeronautics and Space (ISAE) (FR)	
Systems engineering and design	Air vehicle flight systems – electrical engineer	BSc, MSc, Military Technology, Specialisation in Aerospace Electrical Systems	University of Defence (CZ)	
Systems engineering and design	Air vehicle flight systems – mechanical engineer	BSc, Aircraft Engineering	Estonian Aviation Academy (EE)	
Systems engineering and design	Air vehicle avionics systems engineer	BSc, Aircraft Engineering, Specialisation in Avionics	Estonian Aviation Academy (EE)	
Systems engineering and design	Electromagnetic compatibility engineer	BSc, Engineering Science, focus on Defence Technology	Helmut Schmidt University, University of the Federal Armed Forces (DE)	Electromagnetics, Optics and Microwave Engineering

Systems engineering and design	Design validation engineer	MSc, Avionic Systems Design	Cranfield University (UK)	
Systems engineering and design	Whole systems integration engineer	MSc, Embedded Systems,	Higher Institute of Aeronautics and Space (ISAE) (FR)	
Platform engineering	Aerostructures engineer	MSc, Aerospace Mechanics and Avionics, Specialisation in Aeronautical Structures	Higher Institute of Aeronautics and Space (ISAE) (FR)	
Platform engineering	Air vehicle dynamics engineer	MSc, Flight Dynamics	Cranfield University (UK)	
Powerplant engineering	Fluid dynamics and combustion engineer	MSc, Aeronautical Mechanics and energetics	Higher Institute of Aeronautics and Space (ISAE) (FR)	Fluid Dynamics
Powerplant engineering	Structure engineer	BSc, Engineering Science, focus on Defence Technology	Helmut Schmidt University, University of the Federal Armed Forces (DE)	Structural Mechanics
Powerplant engineering	Materials engineer	MSc, Advanced Manufacturing Processes	Higher Institute of Aeronautics and Space (ISAE) (FR)	
Unmanned air system (UAS) engineering	Autonomy engineer	MSc, Aerospace Engineering	Tecnico Lisboa (PT)	Autonomous Systems
Unmanned air system (UAS) engineering	Operational governance manager	MSc, Aerospace Manufacturing	Cranfield University (UK)	Autonomous Systems and Operations
Integrated test, evaluation and acceptance	Platform test engineer	MSc, Aircraft design	Cranfield University (UK)	Reliability, Safety Assessment and Certification
Integrated test, evaluation and acceptance	Systems test engineer	MSc, Aeronautical and Space Systems, Specialisation in Aircraft Systems	Higher Institute of Aeronautics and Space (ISAE) (FR)	

Table C.2. Air – In-service support

Functional competence	Occupation	Example of course	Awarding institution	Specialised module
Synthetic environment	Synthetic environments engineer	MSc, Aerospace Engineering, Specialisation in Control and Operations	Delft University of Technology (NE)	
Logistics and service management	Safety and governance manager	MSc Aviation Safety – Aircraft Airworthiness	Higher Institute of Aeronautics and Space (ISAE) (FR)	
Field Support	Maintenance engineer	BSc, MSc, Military Technology, Specialisation in Engineer Technology	University of Defence (CZ)	
Operations	Flight operations manager	BSc, Management of Aviation Communication and Navigation Systems	Estonian Aviation Academy (EE)	

Table C.3. Land – Design, Engineering and Manufacture

Functional competence	Occupation	Example of course	Awarding institution	Specialised module
Design	Design engineer	MSc, Vehicle and Weapon Engineering	Cranfield University (UK)	Light weapons design, Gun Systems Design
Systems engineering and design	Low-observability engineer	BSc, Engineering Science, focus on Defence Technology	Helmut Schmidt University, University of the Federal Armed Forces (DE)	Corrosion, Failure Analysis and Prevention
Weapons systems	Weapons designer	BSc, MSc, Engineering, SSMW, Ballistic and Weapon Systems; BSc, MSc, Polytechnics	Royal Military Academy (BE)	
Weapons systems	Ballistics engineer	BSc, MSc, Engineering, SSMW, Ballistic and Weapon Systems; BSc, MSc, Polytechnics	Royal Military Academy (BE)	
Platform engineering	Framework / chassis engineer	BSc, MSc, Engineering Science, focus on Defence Technology	Helmut Schmidt University, University of the Federal Armed Forces (DE)	
Powerplant engineering	Electrical systems engineer	MSc, Military Electronic Systems Engineering	Cranfield University (UK)	
Integrated test, evaluation and acceptance	Platform test engineer	MSc, Military Vehicle Technology	Cranfield University (UK)	Survivability – platform simulation

Integrated test, evaluation and acceptance	Systems test engineer	BSc Communication Engineering - organisation and management of tactical units of logistics; specialisation in artillery and anti-aircraft weapons, optics and ammunition	AAD and CIS faculty, Vasil Levski National Military University (BG)	
Logistics and service management	Safety and governance manager	MSc, Organisational and capability management	'Nicolae Balcescu' Land Forces Academy (RO)	
Operations	Land operations manager	BSc Communication Engineering - organisation and management of tactical units of logistics; specialisation on artillery and anti-aircraft weapons, optics and ammunition	AAD and CIS faculty, Vasil Levski National Military University (BG)	

Table C.4. Naval - Management

Functional competence	Occupation	Example of course	Awarding institution	Specialised module
Programme management	Planning and production support manager	BSc, MSc, Military Sciences and Information, Accredited in Navy Command; Logistics Command	Universitatea Nationala de Aparare Carol '1' (RO)	
Programme management	Cost estimator	BS, MSc, Military Sciences and Information, Accredited in Navy Command; Financial-Economic Management	Universitatea Nationala de Aparare Carol '1' (RO)	

Table C.5. Naval – Design, engineering and manufacture

Functional competence	Occupation	Example of course	Awarding institution	Specialised module
Design	Draughtsman and CAD designer	MSc, Marine Technology	Delft University of Technology (NE)	
Design	Mechanical / fluids designer	MSc, Engineering, Naval Operations	Royal Military Academy (BE)	Mechanical Design I & II
Design	Vessel electronics / navigational systems designer	MSc, Naval Engineering	Polytechnic University of Madrid (ES)	Electrical Systems Used in Navigation
Design	Low-observability designer	BSc, Engineering Science, focus on Defence Technology	Helmut Schmidt University, University of the Federal Armed Forces (DE)	Corrosion, Failure Analysis and Prevention
Design	Design engineer	MSc, Marine Technology, Specialisation in Design, Production and Operation	Delft University of Technology (NE)	Ship Design, Ship Production
Design	Detail and installation designer	MSc, Marine Technology, Specialisation in Design, Production and Operation	Delft University of Technology (NE)	Ship Design
Design	Electromagnetic compatibility engineer	BSc, Naval Architecture and Marine Engineering	Tecnico Lisboa (PT)	Electromagnetism and Optics
Design	Electrical and control designer	MA, Political and military sciences, Naval operations	Royal Military Academy (BE)	Naval platforms : Electric Systems
Design	Design validation engineer	MSc, Marine Technology / Defence	University of Southampton (UK)	Optimisation in engineering design

Engineering	Mechanical / fluids engineer	BSc, Mechanical Engineering	Vienna University of Technology (AT)	Fundamentals in Fluid Mechanics, Fluid Mechanics 2, Fundamentals of Numerical Thermo-Fluid Dynamics , Applied Fluid Mechanics
Engineering	Propulsion engineer	MSc, Aeronautical mechanics and energetics; specialisation in aerodynamics-propulsion	Higher Institute of Aeronautics and Space (ISAE) (FR)	
Engineering	Acoustics / signatures / dynamics engineer	MSc, Naval Engineering	Polytechnic University of Madrid (ES)	Structural Dynamics and Vibration
Engineering	Electrical and control engineer	MSc, Naval Engineering	Polytechnic University of Madrid (ES)	Electrical Engineering, On-board Electronics
Engineering	Naval architecture / marine engineer	MA, Political and Military sciences	Naval Operations, Royal Military Academy (BE)	Naval Platforms: Architecture
Engineering	Hull / structural / arrangements engineer	BSc, Engineering Science, focus on Defence Technology	Helmut Schmidt University, University of the Federal Armed Forces (DE)	Naval Shipbuilding
Engineering	Propulsion/ combustion and fluid dynamics engineer	MA, Political and Military sciences	Naval Operations, Royal Military Academy (BE)	Fluid mechanics
Engineering	Nuclear propulsion engineer	MSc, Naval engineering	Polytechnic University of Madrid (ES)	Propulsion Systems
Engineering	Systems engineer	BSc, Electrical Engineering and Information Technology – Specialisation in Naval Architecture; Control and Systems	University of Split (CR)	
Engineering	Operational governance manager	MSc, Marine Technology / Defence	University of Southampton (UK)	Marine project management; Risk reliability and safety

Production	Outfitting engineer	MSc, Marine Technology / Defence	University of Southampton (UK)	
Production	Structure engineer	BSc, Engineering Science, focus on Defence Technology	Helmut Schmidt University, University of the Federal Armed Forces (DE)	Structural mechanics
Integrated test, evaluation and acceptance	Platform test engineer	MSc, Marine Technology / Defence	University of Southampton (UK)	Structural and material response to the marine environment

Table C.6. Naval – In-service support

Functional competence	Occupation	Example of course	Awarding institution	Specialised module
Logistics and service management	Safety and governance manager	MSc, Marine Technology, Specialisation in Design, production and operation	Delft University of Technology (NE)	
Logistics and service management	Sustainability manager	MSc, Marine Technology, Specialisation in Design, production and operation	Delft University of Technology (NE)	
Logistics and service management	Fleet services manager	MSc, Marine Technology, Specialisation in Design, production and operation	Delft University of Technology (NE)	
Operations	Port operations manager	MSc, Naval Engineering	Polytechnic University of Madrid	Integrated Logistical Support
Field support	Maintenance engineer	MSc, Advanced Master in Naval Architecture	University of Liege (BE)	

Table C.7. Complex Weapons – Design, engineering and manufacture

Functional competence	Occupation	Example of course	Awarding institution	Specialised module
Design	Production engineer	MSc, Weapon Engineering	Cranfield University (UK)	
Missile systems	Missile designer	MSc, Astronautics and Space Engineering	Cranfield University (UK)	GW – Structures, Aeroelasticity and Power Supplies
Missile systems	Lethality engineer	MSc, Astronautics and Space Engineering	Cranfield University (UK)	Weapon Systems Performance Analysis
Missiles systems	Mechanical engineer	BSc, MSc, Mechanical Engineering	Technische Universität, Wien (AT)	
Missile systems	Electronic engineer	BSc, MSc, Engineering, SSMW, Ballistic and Weapon Systems; BSc, MSc, Polytechnics	Royal Military Academy (BE)	Electrical weapons
Guidance, control and navigation	Guidance and control engineer	BSc, MSc, Engineering, SSMW, Ballistic and Weapon Systems; BSc, MSc, Polytechnics	Royal Military Academy (BE)	Guided weapon systems
Systems engineering and design	Low-observability engineer	BSc, MSc, Engineering, SSMW, Ballistic and Weapon Systems; BSc, MSc, Polytechnics	Royal Military Academy (BE)	Threat and protection in armed conflicts, I & II
Logistics and service management	Safety engineering and governance engineer	MSc, Astronautics and Space Engineering	Cranfield University (UK)	Reliability and System Effectiveness
Logistics and service management	Sustainability manager	MSc, Astronautics and Space Engineering	Cranfield University (UK)	Reliability and System Effectiveness

Integrated test, evaluation and acceptance	Test specialist	BSc, MSc, Engineering, SSMW, Ballistic and Weapon Systems; BSc, MSc, Polytechnics	Royal Military Academy (BE)	Ballistic impact on personnel and vehicles
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Table C.8. Complex Weapons – In-service support

Functional competence	Occupation	Example of course	Awarding institution	Specialised module
Operations	Support operations manager	BSc Communication Engineering - organisation and management of tactical units of logistics; specialisation in artillery and anti-aircraft weapons, optics and ammunition	AAD and CIS faculty, Vasil Levski National Military University (BG)	

Table C.9. C4ISTAR – Design, engineering and manufacture

Functional competence	Occupation	Example of course	Awarding institution	Specialised module
Systems engineering and design	Electronic warfare systems engineer	MSc, Military Electronic Systems Engineering	Cranfield University (UK)	Electronic warfare for defence
Systems engineering and design	Electronic compatibility engineer	MA, Political and Military Sciences	Royal Military Academy (BE)	Electrotechnics
Systems engineering and design	Communication systems engineer	BSc, Communication Engineering	AAD and CIS faculty, Vasil Levski National Military University (BG)	
Hardware and sensors engineering	Acoustics technologies engineer	MSc, Aeronautical Engineering and Astronautics	RWTH Aachen University (DE)	Acoustics
Hardware and sensors engineering	Optics and electrooptics engineer	MSc, PhD, Optoelectronics	Military University of Technology (PO)	
Hardware and sensors engineering	RF and microwave engineer	MSc, Engineering, Advanced Electronic System Design and Integration	Technical University, Sofia (BG)	Modelling of RF Devices and Circuits

Table C.10. C4ISTAR – In-service support

Functional competence	Occupation	Example of course	Awarding institution	Specialised module
Operations	Operations manager	MSc, Military Operational Research	Cranfield University (UK)	
Logistics and service management	Safety and governance manager	BSc, Engineering Science, focus on Defence Technology	Helmut Schmidt University, University of the Federal Armed Forces (DE)	Logistics

Table C.11. Space – Design, engineering and manufacture

Functional competence	Occupation	Example of course	Awarding institution	Specialised module
Systems engineering and design	Electronic compatibility engineer	MSc, Space Science and Technology, focus on Space Technology and Instrumentation	Luleå University of Technology (SW)	
Systems engineering and design	Spacecraft environments and effects engineer	MSc, Spacecraft Design	Luleå University of Technology (SW)	
Software engineering	Space system software engineer	MSc, Aeronautical and Space Systems, Specialisation in Avionics	Higher Institute of Aeronautics and Space (ISAE) (FR)	Software engineering
Hardware engineering	Spacecraft electrical power engineer	MSc, Space Flight, Specialisation in Space Engineering	Delft University of Technology (NE)	
Hardware engineering	Space system control engineer	MSc, Space Systems Engineering Advanced Master	Higher Institute of Aeronautics and Space (ISAE) (FR)	
Hardware engineering	Optics engineer	MSc, Space Systems	University of Liege (BE)	Instrumental Optics I & II
Hardware engineering	Optoelectrics engineer	BSc, Engineering Science, focus on Defence Technology	Helmut Schmidt University, University of the Federal Armed Forces (DE)	Electro-optics

Table C.12. Awarding Institutions' Websites

Awarding institution	Website
Delft University of Technology (NE)	http://www.tudelft.nl/en/
Warsaw University of Technology (PO)	http://www.pw.edu.pl/engpw
Helmut Schmidt University, University of the Federal Armed Forces (DE)	http://www.hsu-hh.de/hsu/index.php
Higher Institute of Aeronautics and Space (ISAE) (FR)	http://www.isae.fr/en/node/441
University of Defence (CZ)	http://www.unob.cz/en/Pages/default.aspx
Estonian Aviation Academy (EE)	http://www.lennuakadeemia.ee/en
Cranfield University (UK)	http://www.cranfield.ac.uk/
Tecnico Lisboa (PT)	http://tecnico.ulisboa.pt/en/
Royal Military Academy (BE)	http://www.rma.ac.be/en/
AAD and CIS faculty, Vasil Levski National Military University (BG)	http://www.aadcf.nvu.bg/en/index_en.html
'Nicolae Balcescu' Land Forces Academy (RO)	http://www.armyacademy.ro/english/
Universitatea Nationala de Aparare Carol 'I' (RO)	http://www.unap.ro/index.php/en/
Polytechnic University of Madrid (ES)	http://www.upm.es/internacional
University of Southampton (UK)	http://www.southampton.ac.uk/
University of Split (HR)	http://www.unist.hr/
University of Liege (BE)	http://www.ulg.ac.be/cms/c_5000/en/home
Technische Universität Wien (AT)	http://www.tuwien.ac.at/en/
RWTH Aachen University (DE)	http://www.rwth-aachen.de/cms/~a/root/lidx/1/

Military University of Technology (PO)	http://www.wat.edu.pl/
Technical University Sofia (BG)	http://www.tu-sofia.bg/
Luleå University of Technology (SW)	http://www.ltu.se/