

Defence related skills

3rd EDSP workshop

18 September 2018 | Brussels



3rd EDSP Workshop

Agenda

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Welcome and introductions | 11:30 – 11:45
Project overview | 11:45 – 12:00
Session 1 | 12:00 – 13:15
     Research findings to date – examples of skills gaps across EU defence industry
     Implications and discussion
Lunch | 13:15 – 14:00
Session 2 | 14:00 – 15:15
     Research findings to date – preliminary survey results on skills gaps and shortages
     Implications and discussion
Coffee break | 15:15 – 15:30
Session 3 | Implications for EU defence skills strategy | 15:30 – 16:15
Closing remarks | 16:15 – 16:30
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Introduction

Purpose of the project and the workshop

- The **aim of the project**, is to complete the evidence base on skills, introduce an industry-led European Defence Skills Partnership (EDSP) and deliver a sectoral skills strategy, agreed and validated by stakeholders
- The **EDSP** represents a cross section of the defence skills stakeholder community. During this project, it will provide input into the European skills strategy for the defence sector
- The **purpose of this workshop** is to elicit stakeholder and expert views on the ongoing research and seek the EDSP views and feedback on completed and forthcoming project activities



Project overview | Structure and deliverables

Timeline

				2018						2019	
Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Object and ex Metho	ives: Analyse (isting and prop ods: Literature	gaps and prion posed skills pr review, expen	rities arising f ogrammes a rt consultatio	from the der cross Europe on, survey, ex	mand for de e; assemble xpert intervi	fence skills, the EDSP ews	CDD Skills str Method	ve : Identify gr ategy and im Is : Literature	ood practice, plementatio review, expe	, and design s n roadmaps ert consultati	sectoral on, survey
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conterence

Project overview | WP1 Objective

Investigate EU defence industrial skills gaps, shortages and mismatches, and examine current efforts and structure aimed at developing skills



Development of "Vision on defence related skills for Europe today and tomorrow"



• Explores what **demand dynamics** mean for the ecosystem of defence skills

Stage 2

- Analyses the supply of defence-related skills by providing an overview and a SWOT analysis of existing and emerging policies and programmes
- Provides a more in-depth assessment of the skills landscape, focusing on gaps and shortages of defence-related skills across Europe

Stage 4

- Articulates implications of identified gaps in skills programmes for European approach to defence-related skills
 Proposes initial
- recommendations for improving skills availability

Stage 1





Session 1 Research findings to date: Examples of skills gaps across EU defence industry



Session 1 | Research findings to date

Overview of research conducted to date



To date, the research team has **interviewed** 35 stakeholders, with more interviews scheduled in September **The survey** was launched on 23 July with over 80 responses received to date



Reviewed over 500 defence related skills programmes and initiatives across a total of 19 EU countries; programme partnership type: 40 public-private | 171 public authority | 53 intra-company

Reviewed national defence strategies and defence industrial strategies

Drafted 10 indicative country profiles (although scope of research is EU-wide)



Session 1 | Examples of skills gaps across EU defence industry

There are notable differences between European DTIBs and their respective skills needs and existing skills programmes



• Selected country profiles serve as **case studies of good practice** that provide examples of skills gaps and shortages across European defence industry

While the work has a cross-cutting pan-European focus, the following countries were selected for more in-depth analysis:



Denmark	
DITB size	Turnover €400M per annum; ~ 3,000 employees
Domain focus	Aerospace and complex weapons - advanced subsystems &software in communication &radar technology
Defence capabilities	Manufactures subcomponents and parts of weapon systems; in 2017 purchased 27 F-35 fighter jets
Exports	~80% of the defence industry's production is exported
Selected companies	Terma, Scandinavian Avionics, Systematic, Gomspace, Hydrema
Skills landscape	 To ensure Danish defence skills in strategic areas, national policies promote cooperation with foreign suppliers to transfer knowledge, skills and technologies to Danish companies Due to the SME-dominated Danish defence sector, most skills programmes are run by the government FAD and CenSec initiate and facilitate clusters and innovation networks that transfer defence industry know-how and skills
Identified skills gaps and challenges	 Marketing and sales competences specifically related to the defence market Administrative skills and capacity to manage export licenses and other procedures of defence equipment Production planning, management and organisational skills for building manufacturing capacity & quality STEM skills in areas such as advanced manufacturing, electronics, and software Manufacturing automation technologies and skills needed to achieve certification in production
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Finland	
DITB size	Turnover €1.4B in 2016; ~ 6,100 employees ; nearly all DITB companies are SMEs
Domain focus	Land and aerospace sub-systems
Defence capabilities	Manufactures SALW (small arms and light weapons), communications solutions Upcoming acquisitions: Squadron 2020 project (missile boats, minelayers); replacement of F/A-18C/D Hornet fighters as part of the HX New Fighter programme
Exports	~46% of the defence industry's turnover is generated through export
Selected companies	Patria, Sako, Bittium
Skills landscape	 Most defence, aerospace and security companies are SMEs under private ownership The largest Finnish defence company, Patria, however is 50.1% state-owned Scope for more cooperation between government, industry and academic education providers on skills Cyber skills have gained prominence in the last few years with the government committed to including cyber security skills into the national education curriculum and allocating more funding for cyber training
Identified skills gaps and challenges	 Skills shortages identified at operational and technical levels, as well as in engineering, cyber security and emerging technologies Operational and technical skill sets are challenging to develop because they require a combination of knowledge and expertise that includes technical, sciences and military aspects
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France	
DITB size	Composed of around 10 prime contractors and 4,000 SMEs; turnover € 15B; ~ 200,000 employees
Domain focus	Cross-domain, in particular air, space, sea, land
Defence capabilities	Manufactures aircraft, helicopters; submarines, naval vessels, weapons & missiles; space launch vehicles Selected upcoming acquisitions: ~1,700 armoured vehicles (army); 5 frigates, 4 nuclear-powered attack submarines, 9 offshore patrol vessels (navy); 12 in-flight refuelling tankers, 28 upgraded Rafale fighter jets, 55 upgraded Mirage 2000 fighters (air)
Exports	~€6.9 billion in exports in 2018 (aircraft, helicopters, missiles, surface vessels and submarines, tanks, etc.)
Selected companies	Airbus Group, Dassault Aviation, Nexter Group, Naval Group, MBDA, Thales, Safran Group
Skills landscape	 There is an increasing level of collaboration between the government, industry and academia on skills programmes and joint efforts by companies to work together to leverage common benefits. Skills programmes in France include a range of educational and training programmes within public institutions as well as internships, apprenticeships and graduate programmes within companies. Company programmes focus on skills critical to design, support and manufacturing as well as innovating and harnessing new technologies for military applications
Identified skills gaps and challenges	 Companies face difficulties in meeting their skills needs as well as in attracting and retaining talent. Skills that are in short supply include engineering; digital including data management, cyber and AI, for which programs are only recently emerging; as well as operators and technicians
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Germany	
DITB size	Turnover €30B per annum; ~ 100,000 employees in 2016
Domain focus	Aerospace, land, naval with the focus on frigates and conventional attack submarines
Defence capabilities	Areas of strength: air defence systems: TLVS (2015), NNbS (2018); ground defence: LAND 400; other naval , cyber programmes
Exports	€6.8B in exports in 2016, with naval vessels constituting the main part
Selected companies	Hensoldt, Airbus, Rheinmetall, KMW, ThyssenKrupp, Lürssen
Skills landscape	 Strong focus on skills in areas such as mechanical engineering, electrical engineering, product design, business administration, and computer science skills The common dual-degree structure of learning in industry-led programmes that combine academic education with on-the-job training can support the seamless integration of learners into the industry workforce more effectively than traditional classroom based learning General maturity and popularity of the vocational training system makes it a viable and prestigious educational alternative to a more academic route at school or university
Identified skills gaps and challenges	 The stigma attached with the defence industry constrains recruitment initiatives and produces a shortage in the necessary skills, despite perception by industry that programmes are fit-for-purpose Main skills shortages are around engineering positions, supply chain program managers, software and data managers and developers, etc

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Italy	
DITB size	Turnover €16B; ~ 60,000 employees in 2017
Domain focus	Aerospace and Naval, Land (infantry vehicles)
Defence capabilities	Manufactures naval assets; MBT, Armoured infantry fighting vehicles; C4ISTAR systems, avionics, opto- electronics, electronic warfare, radar and sensors; helicopters, UAV MALE. Acquisition: multi-role aircraft; F-35 (Italy is Tier 2 supplier), transport/heavy helicopters; turboshafts, turboprops and turbofan engines; guided bomb
Exports	Total value €10.7B; export bombs, torpedoes and missiles; land vehicles; naval vessels; aircraft
Selected companies	Leonardo, Fincantieri, Iveco Defense Vehicles, Beretta
Skills landscape	 Larger companies offer internships to graduates within established programmes, aiming to align academic programmes to labour market needs Due to the renewed defence policy's focus on dual-use, most existing programmes do not target specialised defence skills. However, there is an emphasis on the importance of new technologies, especially in the cyber domain
Identified skills gaps and challenges	 Italy has a shortage of STEM graduates and a problem of skill mismatch that in some sectors is exacerbated by the prevalence of family-run SMEs and the transition to industry 4.0. In light of current and projected acquisition and export programmes, the demand for skills is likely to increase, especially in the naval and aerospace domains, and at all stages of a product lifecycle.
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Netherlands	
DITB size	Turnover €4.5B; ~ 24,800 employees; comprised of 651 companies
Domain focus	Largely manufactures domain-agnostic sub-systems and components
Defence capabilities	ICT, sensors, software, simulations, electronics, containers, propulsion systems, missiles, weapons
Exports	Over €3B, with 84.4% of exports being parts and components for weapons and ammunition
Selected companies	Damen, Thales ND, Fox-IT. NDTIB is largely made up of SMEs that cover subsystems across all domains
Skills landscape	 Technology priority areas include cross-domain engineering, management, and cyber The skills targeted by national and industry-led programmes match the identified technology priority areas in the Netherlands Defence Industry Strategy Due to the large presence of SMEs in the NDTIB, external training organisations play a prominent role in offering opportunities to develop the skills base of the Dutch defence industry
Identified skills gaps and challenges	 However there is a shortage in STEM skills due to the lack of young people entering careers in the relevant STEM fields Some gaps include: engineers with specialisms in advanced development; electrical engineers; systems engineers with specialisms in AI; software engineers; engineers with specialisms in radar systems; software developers and engineers; python developers; Ethical hackers
4.5	EDSP

Poland	
DITB size	~127 companies and over 60,000 employees; PGZ (17,500 employees, annual turn-over of €1
Domain focus	Land, with smaller industries in aerospace, shipping and complex weapons
Defence capabilities	Manufactures armoured and artillery vehicles; helicopters, light fixed wing aircraft; small surface vessels; small arms; electronics. Upcoming acquisitions: air defence systems, multipurpose helicopters, UAVs, coastal defence vessels, mine destroyers, submarines
Exports	In 2017 €2.5million, with significant year-to-year fluctuation; 61% of export are armoured vehicles
Selected companies	PGZ, Sikorsky/PZL Mielec, PZL-Swidnik, Shipbuilding Repair Shipyard Gdansk, TELDAT, Ultratech
Skills landscape	 The conflict between state ownership and the attempts to move towards rationalisation and privatisation play an important role in setting the scene for skills landscape The largest industrial player, PGZ, established cooperation with Poland's leading universities, leading to joint R&D, traineeships, internships, and the creation of new educational programmes The national ambition for the defence industry to spear-head industrial development, coupled with an increase in the defence budget, may lead to further interest in investing in the skills and competences necessary to support the industry
Identified skills gaps and challenges	 Skills that require more attention include marketing, strategy building and knowledge of foreign markets, as well as competences in emerging technologies and a greater managerial focus on innovation and engaging openly with academia or non-traditional partners
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Spain	
DITB size	Turnover € 5.7B in 2016; ~ 210,000 defence industry personnel
Domain focus	Aerospace and maritime, focus on electronics
Defence capabilities	Manufactures aircraft, ships, ammunition and weapons; imports armoured vehicles
Exports	Aerospace sales account for 79% of defence exports; also export frigates
Selected companies	Navantia, Indra, Airbus, General Dynamics European Land Systems
Skills landscape	 National programmes benefit from collaboration between government and academia, targeting engineering as a key skill for all branches of the armed forces Industry programmes demonstrate collaboration between industry and academia, and a focus on key STEM skills, and specific skills e.g. aeronautical engineering While there is a lack of government-industry programmes, the role of state ownership would imply that there is often close collaboration
Identified skills gaps and challenges	 OECD identified digital skills as particular shortage, and contributes to reported cybersecurity skills shortages (e.g. in IT design) which is likely to impact the local IT industry in Spain STEM skills, crucial to the naval, aerospace and electronics sector are in high demand. However, given the high number of programmes focus on STEM skills (e.g. university, military colleges), these shortages may be mitigated

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Sweden	
DITB size	Turnover € 2.9B in 2015
Domain focus	Aerospace (combat air), naval
Defence capabilities	Combat air (Gripen); ELINT/SIGINT/AWACs aircraft; corvettes, conventional submarines; ground vehicles
Exports	Main areas of export are air defence and underwater systems; € 1.19B in 2017
Selected companies	Saab Group, BAE Systems AB
Skills landscape	 Sweden exhibits an example of a knowledge triangle with the government, industry and academia strategically aligned to ensure the growth and maintenance of key defence industrial skills Early and high civic engagement with the defence sector could support recruitment efforts in the Swedish defence industrial base Government skills development programmes exhibit a strong focus towards defence-specific skillsets As a small country, Sweden faces constraints in terms of resources and number of people
Identified skills gaps and challenges	 Identified gaps/vacancies for Gripen: electro-optical engineers; software engineers; software developers with specialisms in avionics; strategy manager; system developers; constructors Perceived wider gaps: computational engineers in explosive technology; systems integrators; electrical engineers; software developers; electronics designers with specialisms in missiles; maintenance personnel for ground support systems, etc.
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United Kingdom	
DITB size	Turnover € 25.6B in 2016; ~ 146,000 direct employees, 120,000 employed through the supply chain
Domain focus	Aerospace , space, naval
Defence capabilities	Manufactures large amount of aerospace capabilities; 15% of the global F-35; ongoing major investments in aircraft carriers nuclear submarines (Astute SSN and Dreadnought SSBN), cyber, armoured vehicles (Ajax, Challenger update), attack and transport helicopters (Apache/Wildcat, Merlin), satellites (Skynet)
Exports	average annual value €8.11 billion; 85% of exports are in aerospace (wings, engines, and aircraft interiors)
Selected companies	BAE Systems, Rolls Royce, GKN, QinetiQ, Babcock, Cobham, MBDA
Skills landscape	 A strong emphasis on developing STEM skills includes areas such as advanced manufacturing, electronics and software and domain-specific skills in the naval and combat air sectors There is a high level of industry involvement and collaboration with government-led skills programmes (the Trailblazer initiative) Largest defence companies run graduate programmes, apprenticeships and internships, all with a varied specialisation on defence
Identified skills gaps and challenges	 Gaps identified across-cutting skillsets across areas such as advanced manufacturing, nanotechnology and quantum science Other skills gaps include: systems and software engineering, mechanical engineering, project management, technicians
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Session 1 | Discussion

What are the current skills needs of defence industry in the EU?



- Most of the skills programmes examined thus far are provided by national governments, academia or in-country industry – however training can also be part of defence equipment programmes (e.g. part of tech transfer). What has been the general experience with this approach, and what are some advantages and disadvantages in terms of addressing European industry's skills needs?
- The examples have indicated need for business skills and defence-specific marketing/sales as well as STEM skills. In general, how important do you think that employees with these skills have defence specific knowledge/experience when hired (e.g. is it simply the more senior the role, the greater existing defence specialisation should be)? Does this expectation differ for STEM skills?
- SME training models described include externally provided, government-run, and in-house. What are your views on advantage and disadvantage of each?





LUNCH BREAK 13:15 – 14:00





Session 2 Survey results Skills gaps and shortages



Survey results to date I Skills gaps & shortages

What are the current skills needs of defence industry in the EU (top responses)?

(Survey Question) **Today,** it is difficult for employers to fill the requirement for these occupation areas:

- Information architecture
- Mission systems design
- Whole systems integration engineering
- Software design and engineering
- Electronic warfare systems
- Mission management
- Systems engineering

(Survey Question) Today, it is difficult for employers to fill the requirement for these occupation areas **quickly enough**:

- Project management
- Design engineering
- Systems test engineering
- Procurement
- Cost estimation

- Apparent shortage of defence-specific skills, i.e. unique to defence or specialised for defence (left side,) and potential difficulty in attracting more general skills from civil sector (right-hand side)
- Reported gaps/shortages fall primarily in design, engineering, and manufacturing functional competence groups



Survey results to date I Skills gaps & shortages

What are the future skills needs of defence industry in the EU (top 5 responses)?

(Survey Question) **In 5 years**, it will be difficult for employers to fill the requirement for these skill areas:

- Electromagnetic compatibility design
- Mission management, concept design, development & integration
- Design engineering
- Propulsion, combustion & fluid dynamics engineering
- Electromagnetic compatibility engineering

(Survey Question) **In 10 years**, it will be difficult for employers to fill the requirement for these skill areas:

- Software design and engineering
- Cost estimation
- Make-safe engineering
- Procurement
- Mission systems design

- In the 10 year column, significant overlap with current skills gaps, indicating potential chronic difficulty (competition with civil sector; cyclicality of defence market, lead times for developing new SQEP)
- Longer time-horizon indicates potential shortage of mostly defence-specific skills, but also reflects continued need for 'business' skills



Survey results to date I Skills gaps & shortages

Current and near-term skills gaps emerge in skills specialist to defence*

- Information architecture (33%)
- Mission systems design (31%)
- Software design and engineering (29%)
- Mission management concept design, development and integration (27%)
- Systems engineering (25%)
- Unmanned system engineering (25%)
- Safety and governance management (25%)

- Synthetic environments engineering (23%)
- Design engineering (21%)
- Systems test engineering (21%)
- Design validation engineering (21%)
- Propulsion /combustion and fluid dynamics engineering (19%)
- Laser engineering (19%)

*% of respondents with knowledge in the skills area

- Significant overlap exists between current skills gaps and those identified for the next 5 years, indicating a persistent challenge to recruit and/or retain relevant defence industrial skills
- Large proportion of skills is in system-level skills focused on integration, architecture, test, validation and safety, reflecting the fast changing environment in which defence capability is developed



Survey results to date I Reasons for skills gaps

What are the major drivers of skills gaps and shortages in cross-cutting skills?



Key Takeaways

- Mismatch between employer needs and education/training output indicates need to address curricula and skills anticipation
- Competition with the civil sector (most significant driver) can encompass other drivers (e.g. better remuneration), suggesting a combination of drivers
- Wage competition from within defence sector indicates potential internal skills shortages (e.g. company policies)

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Survey results to date I Reasons for skills gaps

What are the major drivers of skills gaps and shortages in domain-specific skills?



- Competition with the civil sector is a stronger driver for skills gaps in domain-specific skills than for cross-cutting skills
- Workforce demographics (existing talent pool retiring and difficult to replace) may pose significant challenges to highly specialised domain-specific skills



Survey results to date | Implications

What is the impact of identified skills gaps on European defence industry?



- Gap or shortage is affecting research & development progress
- Gap or shortage is affecting ability to meet orders
- Gap or shortage is affecting current production

Gap or shortage is affecting business planning

- Reported skills gaps and shortages appear to be hindering defence industrial innovation and delivery of defence capabilities
- This confirms existence of skills gaps and highlights the need to address these challenges to bolster global competitiveness and improve defence capabilities, as skill gaps have knock-on effects on value for money & quality of defence equipment



Survey results to date I Impact of new technologies

Companies reported challenges in sourcing the skills for new/emerging technologies



*graphic only reflects responses from companies that have indicated they are working on these technologies

Survey results to date I Impact of new technologies

Survey responses identified the following current and upcoming skills gaps in relation to technology areas that companies are planning to work on in the next 5 – 10 years:



*% of respondents who indicated they work in these technology areas

Session 2 | Discussion

What are the possible implications of identified skills gaps and shortages?



Current and future gaps and shortages are focused on STEM-based skills, however while the survey results indicate the challenge in **defence-specific skills**, other research suggests that **general/dual-use shortages/gaps** are impacting the defence industry.

How does this resonate with your knowledge/experience?

Nature of defence market and indication of gaps in defence-specific skills could also point to cyclical challenges based on equipment programmes. In your experience,

- Are skills shortages triggered by or correlated with new equipment programmes or export sales (e.g. difficulty in attracting and training needed personnel)?
- Are skills shortages triggered or correlated with corporate R&D activity (e.g. difficulty in sourcing needed skills)?

Research indicated that STEM, business, defence-specific, and dual-use skills all face some supply challenges.

What should the balance be between educational/training sector in supplying graduates, and defence employers equipping them with defence-specific/business training?





COFFEE BREAK 15:15 – 15:30





Session 3 Implications for EU skills strategy



Session 3 I Implications for EU skills strategy

What should be considered when drafting the EU defence skills strategy?



- How can we address the apparent dual challenge of attracting students to STEM disciplines and defence specialisations, while ensuring they are equipped to work in today's business environment? Will these two parallel challenges require different interventions?
- How can we address the challenge of competing with the civil sector for required skills ?
 - We need to acknowledge that both external and internal shortages exist e.g. employers may not have adequate training or incentives in place
- What other mitigation strategies could firms adopt in an environment of low skills availability (e.g. invest more in automation, outsourcing, collaboration)?

There is evidence of academia collaborating with industry and industry with government, but comparatively few government-industry-academia collaborations were identified, meaning that industry may not have adequate sight of skills demand (from government), and signal needs to education sector effectively.

How can we foster this kind of strategic cooperation, and what are some potential models (e.g. on a regional basis)?



Conclusion

Q&A



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THANK YOU!

