



Strategy for developing HR in the Defence Sector

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**Note: The document has been shared with other partners and WP leaders for gathering inputs and comments at various stages of the preparation of the document*

Table of contents

1. Introduction	2
2. Methodology.....	3
3. Gap Drivers.....	6
3.1 ASSET+ Support Timeline	14
4. Conclusions	16

1. Introduction

The ASSETS+ project aims at creating a strategy to up-skill Defence students and professionals, including the identification and standardization of the job profiles related to the technologies identified in the project.

The work is divided in three macro technological areas, each one analysed by a part of the WP1 team:

- **Robotics, artificial intelligence (AI) and autonomous-systems**, addressed by Aalborg University and Rzeszów University of Technology;
- **C4ISTAR**, addressed by Bordeaux University and Pisa University;
- **Cybersecurity**, addressed by Carlos III University and Seville University.

The strategy will evolve the ESDP strategy (EUROPEAN DEFENCE SKILLS STRATEGY 2020-2024) by identifying concrete actions, best practices, projects and set of activities to match demand and supply of skills. Moreover, it will be built upon the Defence Technology Roadmap (R1.2), the Skill Blueprint (R1.2) and the Fiches (R.16), a series of policies, projects and best practices.

The goal of the task T1.2 "Technology Mapping" is to map technologies relevant to Defence applications, the task T1.3 "Emerging skills related to selected techs" aims at understanding the skills demand in the defence sector related to the selected technologies to help design new educational and training programmes. The objective of the task T1.6 "Fiches" is to present the existing and planned EU, national, regional, and industry-led policies, and other programmes and initiatives aimed at the sustainment and development of defence-related skills.

The results of these tasks will be the foundation of the design of the education and training courses for the Defence sector. They will thus be integrated with the other work packages results with the purpose to address the strategic plan that seeks to identify and fill the skill gaps for Defence students and professionals.

Therefore, this document aims identifying and describing the methodologies that will be undertaken to implement this strategy for the creation and the development of new skills in Robotics, artificial intelligence, autonomous systems, and C4ISTAR and Cybersecurity for the Defence sector.

2. Methodology

The overall methodology adopted in the WP1 for the technologies and skill analysis balances standardization and differentiation: it ensures the coherence of results of the three technological domains and lets each team adopt an approach based on their own expertise both in technical analysis and in Defence.

For what concern the task T1.2 "Technology Mapping", first it is necessary to outline the technological domain with the purpose to identify and collect the documents and generate a list of technologies and applications. This activity includes both manual and automatic approaches. The teams collected documents from various sources to have a heterogeneous database of resources related to each domain. The sources are research institutions, standardization and best practices institutions, companies, thematic websites and market surveys. Different sources allow to reduce biases¹, increase recall² and validate information³. Then, on one hand, a data-driven approach allows to automate the process of extracting keywords related to technologies and to defence applications; on the other hand, several documents have been manually analysed by independent researchers involved with the goal of having a list of technologies and applications.

The identified technologies have been thoroughly analysed in the technologies classification with qualitative and quantitative measures, referred to the maturity level, i.e. the achieved state of a specific technology in its evolution, considering the interest from research and industrial parties, with references to the growth production of new scientific and technical knowledge, and the abstraction level, i.e. the level of detail of a technology.

Finally, the relationship between applications and technologies are described in the relevance matrix, where each row is a technology, each column is an application, and each cell contains the relevance score that quantifies the importance of each technology for a given defence application. A data driven approach automatize the definition of the relevance score, computed by the number of scientific papers containing each pair application-technology. Moreover, one of the teams used a survey to quantify the

¹ The content of each document may be influenced by various factors (e.g. official documents by National or International institutes may be influenced by political decisions, companies may define the technology domain based on their principal competencies and products and thus may offer only one perspective). Therefore, the variety of the sources makes it possible to balance the biases of each source itself.

² The recall is the number of relevant retrieved documents divided by the total number of relevant documents. Having a wide variety of sources increases this variable.

³ Finding the same information in different documents from different sources ensures a higher quality.

relevance score, it was sent to defence-related industrial entities both from the ASSETS+ Consortium and external ones.

For the task T1.3 “Emerging skills related to selected techs”, the first step is an analysis on the current skills landscape to provide a description of the actual request in terms of 3 categories of skills: **technical skills** (skills required to correctly exploit a certain technology within a given defence application), **defence-related skills** (skills connected to the knowledge, the use and the management of methods and procedures typical of the defence applications) and **transversal skills** (soft skills that are having an increasing importance in all the industries and also in defence). Various sources from different domains (job posting, industrial surveys, literature analysis, ESCO databases) are examined with the purpose to identify a list of skills related to each technological domain. The analysis is executed with text mining techniques and expert judgment.

Then, the skills previous listed are linked with the job profiles. ESCO⁴ provides a list of skills that are essential to perform the task related with the given job profile and the optional skills. So, a projection of the skills from the three list of each team on the ESCO database allows to identify the relations between the skills and job profiles. Moreover, for what concerns the cybersecurity domain, this information derives from the NICE framework⁵.

Finally, the teams analyze the skills with qualitative and quantitative indicators, related to the degree of specialization, i.e. how important the skill is for the relative job profile in the Defence sector, the degree of knowledge, i.e. the required level of a skill for the relative job profile to perform a Defence-related job, and the demand from labor market, that indicates how much a skill is required for the given job profile.

Digital technologies are continuously evolving, so there exists the need to monitor the evolution of the impact that these technologies have on jobs and skills within the Defence-related application. The project is therefore based on **iterations** that allow the updating of the documents and the production of new contents with the purpose to follow and foresee the path of changes. During the iterations the databases of documents to be analyzed will be updated with new scientific publications from research institutions, recent edition of standardization and best practices from institutions, additional market and

⁴ ESCO stands for European Skills, Competences, Qualifications and Occupations and it is a database developed for the European Commission for classifying jobs, capabilities, competences, and qualifications based on the International Standard Classification of Occupations (ISCO-08).

⁵ The NICE Cybersecurity Workforce Framework (NICE Framework) is a national-focused resource that categorizes and describes cybersecurity work, it establishes a taxonomy and common lexicon that describes cybersecurity work and workers irrespective of where or for whom the work is performed.

industrial surveys, up-to-date job posting. Then the analysis based on automatic data driven approach and expert judgment will be repeated and so the results compared with ones of the previous iteration, with the purpose to build an interactive framework on technologies, applications and skills in Defence.

The task T1.6 "Fiches" consists in the investigation on the existing and planned EU, national, regional, and industry-led policies, and other programmes and initiatives aimed at the sustainment and development of Defence-related skills, in a form of one page fiches. In particular, the fiches present the initiatives which can have value for Defence industry in skills development:

- policies to show development directions,
- projects to show initiatives undertaken in the areas of Robotics, autonomous systems, artificial intelligence, C4ISTAR and Cybersecurity,
- conferences to indicate the possibilities of sharing and gaining knowledge connected with the analyzed areas,
- university courses (bachelor, master), postgraduate studies, trainings to present the possibilities of knowledge upgrading
- journals to show the sources of knowledge connected with the domains under analysis.

The data related on these initiatives are obtained using a set of keywords connected with the three technological domains from open sources databases available on Internet (both European databases and World databases), and internal resources of University and Industrial Partners. The results are then classified based on the technological domain (Robotics, autonomous systems, artificial intelligence; C4ISTAR; Cybersecurity) and the type of initiatives (policies; projects; trainings; university courses and post-graduate studies; conferences; journals).

In summary, WP1 mainly focuses on the design of the Strategy for developing HR in the Defence sector, by operationalizing the existing studies on the topic and by deepening the links between selected technologies and skills to be trained in WP3.

To address this strategy, the following steps were taken:

- Identification of major gap drivers in key domains, from the EDSP, in which ASSETs+ project can support;
- Definition of supporting actions (SAs) and implementation activities (IAs) along a specific timeline during the 3 years of the ASSETs+ project;
- Alignment of SAs and IAs with ASSETs+ project objectives and specific tasks.

3. Gap Drivers

The ASSETs+ project will contribute to the EUROPEAN DEFENCE SKILLS STRATEGY 2020-2024, by aligning its objectives with the gaps defined in the ESDP strategy.

Since 2013, the European Commission has been encouraging industry and stakeholders to make the best use of existing EU programmes and tools for improving and promoting the Defence Sector. All designed to address skills gaps and to foster new skills, retraining, and reskilling to tackle the challenges of the sector, which was reiterated in the European Defence action plan (https://ec.europa.eu/growth/sectors/defence_en).

In particular, the EUROPEAN DEFENCE SKILLS STRATEGY 2020-2024 identified 5 gap drivers to develop strategies for the up-skilling and re-skilling of the workforce in the Defence sector.

Table 1 describes the 5 gap drivers and how ASSETs+ will tackle the given gap, using both a general point of view on the overall project and a more specific one with some activities.



GAP DRIVERS	ASSETS+ ACTIONS
<p>Demographic challenges and limited strategic focus on skills</p>	<p><u>Overall project:</u></p> <p>ASSETS+ is developing a skills strategy specifically on emerging technologies for the Defence sector.</p> <p>-----</p> <p><u>Activities:</u></p> <p>The task T1.1 “Strategy specification” proposes a strategic vision for upskilling and reskilling workers to make them suitable for the Defence sector. This strategy will be proposed by academic partners and validated by industrial members of the ASSETS+ consortium.</p> <p>The task T2.2 “Guidelines for designing Defence Sector Professional Standards and European Defence Sector matrix for Learning Outcomes” takes into consideration that different EU countries may have different standards for education.</p> <p>The task T2.5 “Design the Education&Training programme prototype for University undergraduates (EQF level 6)” creates opportunity for industry to be involved at an early stage in the design of programmes in general, and upskilling programmes in particular.</p> <p>The task T3.7 “Execution of Edu & Training programme in other context” will improve awareness of defence related skills significance for industry as well as the strategic significance of the skills. It should contribute to ensure the implementation and exploitation of the training programmes at a wider scale than the ASSETS+ consortium. This should help also reduce the gap between employer needs and educational proposals in Europe. It will result in increasing number of skilled workers whose skills concerning dual use technologies can be used in both, defence and non-defence sectors. Moreover, in the educational programs execution positive perception of the defence industry is strengthened and educational programs execution in other contexts.</p> <p>The task T3.9 “Final programmes review, improvement and release” should assess whether training programmes met demographic challenges, should help propose training programmes matching industry partners needs and should assess whether the programmes include elements counteracting employees' negative perception of the defence industry.</p>



GAP DRIVERS	ASSETs+ ACTIONS
<p>Mismatch between employer needs and educational/training input</p>	<p><u>Overall project:</u></p> <p>ASSETs+ promotes ASSOCIATE STAKEHOLDERS INITIATIVE, CO-ORGANISATION OF EVENTS WITH EDSP involving external Industry/stakeholder, therefore it will strengthen coordination between government, industry and education & training. It will facilitate continued collaboration at European level to attain sustainable solutions for common needs and learn from each other. Moreover, implementing this activity, the project contributes in expanding and upgrading the existing ecosystem (EDSP) to accelerate knowledge transfer, allow proactive communication of the sector's needs and faster response through large- scale industry-led partnerships (Pact for Skills). The EDSP events create opportunities of discussions and exchanges between academics and industrials is always useful to reduce these gaps 2 and 3.</p> <p>-----</p> <p><u>Activities:</u></p> <p>WP2 SEMINARS, SPRINTS EVENTS: DEFENCE STUDENTS CHALLENGE: It is a contest about courses with Problem Based learning and project-based learning using cases from Aerospace and Defence sector/companies. It contributes in strengthen coordination between government, industry and education & training. It facilitates continued collaboration at European level to attain sustainable solutions for common needs and learn from each other. The implementing of this activity engages industry, academia and authorities in projects for collaborative building of trainings.</p> <p>The task T1.2 “Technology mapping” improves internal communication between WPs to ensure that the topics defined in WP1 can be easily mapped to programmes and EQF levels. It contributes in reinforcing communication between industrial partners (potential future employer) and academics (programme designers).</p> <p>The task T1.3 “Emerging skills related to selected techs” identifies the skills that are required for workers in the Defence sector in relation to the emerging technologies analysed in the task T1.2 “Technology mapping”. This is indeed valuable to build skills mapping and anticipation tools, as it points out relevant skills that must be developed by future candidates. It considers the expected input to WP2 for each EQF level when designing the skills blueprint.</p>



GAP DRIVERS	ASSETs+ ACTIONS
	<p>The task T2.1 “Design of the pedagogical approach and detailed sub approaches” address this gap since it uses the results from WP1 to design the training courses for workers in the Defence sector.</p> <p>The task T2.2 “Guidelines for designing Defence Sector Professional Standards and European Defence Sector matrix for Learning Outcomes” takes into consideration the industry needs when developing the qualifications and competence units for the Defence sector.</p> <p>The task T2.3 “Design of Education & Training Programme Prototype for VET (EQF Level4 and Level5)” fosters cooperation between industrial partners and vet providers at the beginning of the programme design. It identifies Industrial needs and expectations concerning EQF level 4 and 5 (in vocational training, but also upskilling and reskilling) as well as the added value of defence skills and value them.</p> <p>The task T2.4 “Design of Education & Training Programme Prototype for University undergraduates (EQF Level 6)” creates synergies between industrial partners and academics since the beginning of the design. In fact it allows to exchange with them about their needs and expectations concerning each EQF level, creating more opportunities to present the defence industry, and it ensures the inclusion in the educational program of elements that could strengthen a positive perception of the defense industry.</p> <p>The task T2.5 “Design of Education & Training Programme Prototype University graduates (EQF Level 7)” creates opportunity for industry to be involved at an early stage in the design of programmes in general, and upskilling programmes in particular.</p> <p>The task T3.2 “Edu & Training programmes prototyped (restricted) pilots” allows developing more synergies between industrial partners and academics always helps reduce the mismatch between employer needs and educational programmes. The feedbacks from the students and trainers should help adjust the prototyped programmes. The later can be useful to improve gaps 2 and 3.</p> <p>With the tasks T3.2 “Edu & Training programmes prototyped (restricted) pilots”, T3.7 “Execution of Edu & Training programmes in other contexts” and T8.4 “Education and training programmes prototypes evaluation” ASSETs+ will implement and execute a series of reskilling/upskilling courses for Defence-related technologies including robotics/AI, C4ISTAR and cybersecurity. These courses will be developed by academic partners and validated by industrial members of the consortium.</p>



GAP DRIVERS	ASSETS+ ACTIONS
	<p>The task T3.3 “Internal evaluation on the 3 Education & Training programmes prototyped” will be useful as this will a new opportunity for academics and industrials to exchange. Feedbacks should help reduce the mismatch between employer needs and educational input.</p> <p>The task T3.4 “Programme review, improvement & release” will be an opportunity for the academics to take into account the various returns from the industrial partners and the students to provide training programmes that meet the expectations.</p> <p>The task T3.6 “Design and Implementation of Training the Trainers” can contribute to ensure the implementation and exploitation of the training programmes at a wider scale than the ASSETS+ consortium. This should help reduce the gap between employer needs and educational proposals in Europe. Moreover, ASSETS+ will include a "Train the trainers" activity so that future teachers will be teaching in an effective way. Remarkably, this task is carried out by academic members and reviewed by industrial partners. Therefore, this will contribute to reduce mismatches between talent leaving education and entering the Defence sector.</p> <p>The task T3.7 “Execution of Edu & Training programmes in other contexts” will improve awareness of defence related skills significance for industry as well as the strategic significance of the skills. Executing the training programmes in other contexts should contribute to ensure the implementation and exploitation of the training programmes at a wider scale than the ASSETS+ consortium. This should help reduce the gap between employer needs and educational proposals in Europe. In the educational programs execution positive perception of the defence industry is strengthened. Educational programs execution in other contexts will result in increasing number of skilled workers whose skills concerning dual use technologies can be used in both, defence and non-defence sectors."</p> <p>The task T3.8 “Internal evaluation of implemented Edu & Training programmes” involving industry partners should be a new opportunity for discussions between academics and industry partners.</p> <p>The task T3.9 “Final programmes review, improvement and release” assess whether training programmes met demographic challenges. Final programmes review should help propose training programmes matching industry partners needs and it should assess whether the programmes include elements counteracting employees' negative perception of the defence industry.</p> <p>The task T4.1 “Setting up of the Observatory” is oriented to setting up the Defence Observatory, which will be used as coordination tool among the strategies (tech roadmap and skill blueprint), the activities (WP 2-3 results) and the opportunities</p>



GAP DRIVERS	ASSETS+ ACTIONS
	<p>(other initiatives, projects, funds, legislation, etc..). The Observatory will play a key role in the sustainability of the ASSETS+ project results, thus improving the perception of Defence and a continuous supply of skills. It is thus an important mechanism or institutional arrangement for focusing attention on a particular set of skills and related issues.</p>
<p>Negative perception of the Defence industry as an employer</p>	<p><u>Overall project:</u></p> <p>ASSETS+ organizing the EDSP events create opportunities of discussions and exchanges between academics and industrials is always useful to reduce this gap.</p> <p>-----</p> <p><u>Activities:</u></p> <p>WP2 SEMINARS, SPRINTS EVENTS: DEFENCE STUDENTS CHALLENGE: an opportunity to create more synergies between industrial partners and academics as well as to present a new image of the defence industry.</p> <p>The task T1.3 “Emerging skills related to selected techs” identifies a list of Defence-related applications and job profiles. This can be useful for dissemination to attract future candidates among current University students.</p> <p>The task T2.3 “Design of Education & Training Programme Prototype for VET (EQF Level4 and Level5)” fosters cooperation between industrial partners and vet providers at the beginning of the programme design. It allows identifying Industrial needs and expectations concerning EQF level 4 and 5 (in vocational training, but also upskilling and reskilling) as well as the added value of defence skills and value them.</p> <p>The task T2.4 “Design of Education & Training Programme Prototype for University undergraduates (EQF Level 6)” creates synergies between industrial partners and academics since the beginning of the design. It allows exchanging with them about their needs and expectations concerning each EQF level, creating more opportunities to present the defence industry. It aims at the inclusion in the educational program of elements that could strengthen a positive perception of the defense industry.</p> <p>The task T3.2 “Edu & Training programmes prototyped (restricted) pilots” allows developing more synergies between industrial partners and academics always helps reduce the mismatch between employer needs and educational programmes. The feedbacks from the students and trainers should help adjust the prototyped programmes. The later can be useful to improve gaps 2 and 3.</p>



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	<p>The task T3.7 “Execution of Edu & Training programmes in other contexts” allows the application of the programs in other contexts will improve awareness of defence related skills significance for industry as well as the strategic significance of the skills. Executing the training programmes in other contexts should contribute to ensure the implementation and exploitation of the training programmes at a wider scale than the ASSETS+ consortium. This should help reduce the gap between employer needs and educational proposals in Europe. In the educational programs execution positive perception of the defence industry is strengthened. Educational programs execution in other contexts will result in increasing number of skilled workers whose skills concerning dual use technologies can be used in both, defence and non-defence sectors.</p> <p>The task T3.9 “Final programmes review, improvement and release” should assess whether training programmes met demographic challenges; it should help propose training programmes matching industry partners’ needs; final review should assess whether the programmes include elements counteracting employees’ negative perception of the defence industry.</p> <p>The task T5.6 “European Final conference” will disseminate lessons learned throughout the project, including ideas on how to attract talent to the Defence sector.</p> <p>The work package WP5 “DISSEMINATION AND COMMUNICATION” will create a series of videos to raise the interest of future students to the Defence sector, highlighting the three main technological areas addressed in the project: robotics/AI, C4ISTAR and cybersecurity. It will organise the Students challenge to foster the interest of current University students into Defence-related topics.</p>
<p>Stiff competition for skilled workers from non-defence sector</p>	<p><u>Overall project:</u></p> <p>ASSETS+ med-long term goals within the Pact for Skills will tackle this issues:</p> <ul style="list-style-type: none"> - Defining a common skill framework for standardized taxonomy: <ul style="list-style-type: none"> - KPI: establishment of one Sectoral Qualifications Framework for Aerospace and Defence - KPI: referencing of the Sectoral Qualifications Framework for Aerospace and Defence to the EQF and NQFs - KPI: number of sectoral qualifications for Aerospace and Defence defined in terms of Learning Outcomes - KPI: number of new ESCO profiles related to the Defence Sector - Propose qualification schemes:



GAP DRIVERS	ASSETS+ ACTIONS
	<ul style="list-style-type: none"> - KPI: n. of new Micro-credentials for Aerospace and Defence (MADs) awarded by formal providers (HEIs) - KPI: n. of new MADs awarded by non-formal providers (industry...) - KPI: n. of learners earning MADs (formal and non-formal providers) - KPI: % of yearly increase rate of learners earning MADs (formal and non-formal providers) - KPI: n. of new academic programmes expressing workload according to ECTS System - KPI n. of digital credentials (i.e. qualifications awarded in digital format, e.g. in blockchain) <p>- Grants and funding to support these across different EU countries:</p> <ul style="list-style-type: none"> - KPI: n. of Joint Degree Programmes in the sector of Aerospace and Defence - KPI: n. of Joint courses in the sector of Aerospace and Defence (e.g. summer schools, ...) - KPI: n. of learners enrolled in joint programmes and joint courses - KPI: n. of scholarships provided to learners enrolled in joint programmes and joint courses - KPI: establishment of one European University in Aerospace and Defence <p>ASSETS+ project will support the strategic action 3 “Contribute towards recognition of certification and a standardised EU-level accreditation system for training and education institutions” and the action 3 “Map existing qualifications and link with EU frameworks”.</p> <p>-----</p> <p><u>Activities:</u></p> <p>The task T1.5 “Skills2ESCO” aims to enrich ESCO with the identified skills in the task T1.2. and T1.3 (respectively “Technology mapping” and “Emerging skills related to selected techs”). This may help for future certifications of courses leveraging ESCO skillset.</p> <p>The tasks T3.2 “Edu & Training programmes prototyped (restricted) pilots”, T3.7 “Execution of Edu & Training programmes in other contexts” and T8.4 “Education and training programmes prototypes evaluation” will implement and execute a series of reskilling/upskilling courses for Defence-related technologies including robotics/AI, C4ISTAR and cybersecurity. These courses will be developed by academic partners and validated by industrial members of the consortium.</p>



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	<p>The task T3.7 “Execution of Edu & Training programmes in other contexts” will improve awareness of defence related skills significance for industry as well as the strategic significance of the skills. Executing the training programmes in other contexts should contribute to ensure the implementation and exploitation of the training programmes at a wider scale than the ASSETS+ consortium. This should help reduce the gap between employer needs and educational proposals in Europe. In the educational programs execution positive perception of the defence industry is strengthened. Educational programs execution in other contexts will result in increasing number of skilled workers whose skills concerning dual use technologies can be used in both, defence and non-defence sectors.</p> <p>The task T4.3 “Plan for a European Defence Sector Qualification System for HE and VET” is oriented to create the baseline for the European Defence Sector Qualification System, containing a series of Operational Procedures and Rules on how to implement a quality management system with the purpose of assuring the harmonisation of the qualification system. Furthermore T2.2 “Guidelines for designing Defence Sector Professional Standards and European Defence Sector matrix for Learning Outcomes” will support the development of the training programmes based on a modular approach, which will facilitate the mobility and transferability of skills.</p> <p>The task T6.4 “Recognition and certification of Education and Training Qualification” will focus on the recognition and certification of education and training qualification. Thus, it will be useful for the accreditation of training and education institutions as well.</p>

3.1 ASSET+ Support Timeline

The dynamic timeline to support the activities and actions during the 3 years of the ASSETS+ project, as per the description of each task, is presented in Figure 1.



4. Conclusions

ASSETS+ project aspires to build a sustainable human resources supply chain which allows Defence sector companies to find Defence students and professionals with the necessary skills in order to sustain its leadership, competitiveness and sustainability in the medium to long-term.

This document outlines ASSETS+'s mid to long-term proposed strategy, in terms of HR for the Defence sector. Since the main strategy behind the project was firstly developed in the WP1, their contributions had played a central role within this strategy, particularly through the Defence Technology Roadmap (T1.2) and the Skills Blueprint (T1.3).

Therefore, based on the ESDP strategy (EUROPEAN DEFENCE SKILLS STRATEGY 2020-2024), this document defines the Defence sector's HR needs and how the project is able to address and mitigate those, reflecting the expected findings of the project in a timeline of activities, within ASSET+'s lifetime.