aerofuse
project

Deliverable D2.2
Body of Knowledge: Methodologies

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Executive summary

Deliverable **D2.2, Body of Knowledge: Methodologies**, presents the methodological framework developed within the AEROFUSE project to build a sectoral Skills Intelligence system and a structured Body of Knowledge for the European aerospace ecosystem. The deliverable is an output of **Task 2.2**, which focuses on identifying current and emerging technologies, skills, competences, job profiles and workforce shortages. The analysis concentrates on the three strategic areas addressed by AEROFUSE: satellite and spacecraft manufacturing and operations, aircraft production and Maintenance, Repair and Overhaul (MRO), and airports.

The proposed methodology responds to the rapid transformation of the aerospace sector driven by COVID-19, digitalisation, artificial intelligence, automation, advanced manufacturing, the green transition, geopolitical developments and changing regulatory requirements. These factors are reshaping existing occupations, generating demand for new combinations of technical and transversal competences, and increasing the need for continuous upskilling and reskilling. The methodological framework is therefore designed not only to capture current labour market demand, but also to identify emerging technological and competence areas that may become increasingly important over the next five years.

The research follows a multi-source mixed-methods design combining quantitative and qualitative evidence. Data are collected from scientific publications, industry reports and labour market analyses, online job advertisements, surveys, semi-structured interviews, European projects, educational and training programmes, and the European Skills, Competences, Qualifications and Occupations (ESCO) classification. Evidence obtained from these sources is compared and triangulated to improve the reliability of the findings and to reduce the limitations associated with relying on a single source of information.

The systematic literature review is used to identify technological developments, emerging competence requirements and changes in professional roles reported in academic research. Industry reports provide a practice-oriented perspective on workforce trends, recruitment difficulties and skills shortages, while job advertisements offer direct evidence of the qualifications, experience, technical skills and transversal competences currently requested by employers. The stakeholder survey and interviews complement these sources by capturing organisational experience, anticipated future needs, training priorities and

sector-specific challenges. The analysis of European projects provides additional knowledge on existing skills initiatives, strategies, methodologies and good practices.

A dedicated educational intelligence methodology is also included to analyse the European higher education and vocational education and training offer. Educational documentation, including programme descriptions, course syllabi, learning outcomes, module specifications and workload information, is transformed into a structured dataset. Semantic processing, educational mapping and knowledge-graph approaches are used to examine competence coverage, curriculum progression, content overlaps, redundancies, missing prerequisites and possible gaps between educational provision and industry demand. A pilot implementation within the Aerospace Engineering programme at the University of Seville provides a practical environment for validating and refining this methodology before its broader application across participating institutions.

AI-supported data mining is applied to facilitate the processing of large volumes of textual information. Natural language processing and generative AI tools support the identification, grouping and frequency analysis of technologies, skills, competences and job roles. AI-supported outputs are not treated as final results; they are subject to expert review, contextual interpretation and comparison with other evidence sources. This human-in-the-loop approach is intended to combine the efficiency of automated analysis with the sectoral expertise of the AEROFUSE partners.

The ESCO classification provides a common reference framework for organising and validating identified skills, competences and occupations. A dedicated Python-based browser has been developed to support the exploration of ESCO datasets and the relationships between occupations and associated skills. The comparison of research findings with ESCO will help determine which competence areas and professional profiles are already represented in European classifications and which may require further description because of technological or organisational change.

Preliminary analyses demonstrate the potential of the proposed approach. The initial literature analysis indicates that artificial intelligence is primarily transforming established aviation occupations rather than creating entirely separate professions. Pilots, engineers, air traffic controllers, maintenance specialists, managers and safety professionals increasingly require both conceptual AI literacy and the ability to interpret, supervise and critically assess AI-supported decisions. Initial job advertisement analysis also highlights strong demand for transversal competences such as teamwork, communication, problem-

solving, adaptability, initiative and analytical thinking, alongside technical knowledge related to software development, enterprise systems, cybersecurity, systems engineering, radio-frequency technologies, modelling and digital infrastructure. These observations remain preliminary and will require validation through the complete multi-source analysis.

The stakeholder survey is still ongoing, and the findings currently included in the deliverable are based on an initial set of eleven responses. They should therefore be treated as an indicative evidence base rather than representative sector-wide conclusions. Further responses, interviews, job advertisements, educational programmes and project results will be incorporated into the subsequent analytical stages.

Overall, Deliverable **D2.2** establishes a coherent and scalable methodology for transforming heterogeneous evidence into structured Skills Intelligence. Its outputs provide the methodological foundation for subsequent versions of the AEROFUSE Body of Knowledge, including analyses of technologies, skills shortages and job profiles. The framework will also support the development of the Sector Skills Strategy, the adaptation of education and training provision, the design of upskilling and reskilling activities, and the future AEROFUSE Skills Observatory. In this way, the deliverable contributes to improving alignment between industry needs and European education and training systems and supports the development of a more skilled, adaptable, sustainable and resilient aerospace workforce.

1. Introduction

1.1. Aerofuse project

The AEROFUSE (An Alliance for the Future of the AEROnautics and Upstream Segment Skills Evolution) project is a four-year, EU-funded Erasmus+ initiative dedicated to strengthening and future-proofing skills within the European aerospace and defence ecosystems. Fostering collaboration among 26 partners from 12 countries—including academia, VET providers, industry clusters, SMEs, NGOs, and governance—the project focuses on three strategic segments not sufficiently covered by previous Blueprint initiatives: satellite and spacecraft manufacturing and operations, aircraft production and Maintenance, Repair and Overhaul (MRO), and airports. The project is designed to address critical industry challenges, including rapid digitalization, the green transition, persistent skills shortages, workforce ageing, and mounting geopolitical and economic pressures. By building strong links between stakeholders to ensure that educational offerings are aligned with real labor

market needs, the project aims to reduce skills mismatches, improve employability, and support innovation and industrial competitiveness. Driven by a long-term vision to ensure the continuity of its tools and partnerships well beyond the project's lifespan, AEROFUSE contributes to a greener, more digital, and more resilient Europe.

1.2. Objectives of the Work Package 2

The Work Package 2 establishes a robust skills intelligence framework to bridge the gap between aerospace industry demands and current EU educational offerings. It analyses how external drivers, such as the post-pandemic period, digital/deep+-tech and green transformation, and geopolitical shifts influence career profiles. By examining subsectors (satellite and spacecraft manufacturing and operations, aircraft production and Maintenance, Repair and Overhaul (MRO), and airports), the package identifies critical skills and competences misalignments and provides strategy to reduce them. The methodology employs structured data gathering to ensure decisions are evidence-based. Ultimately, WP2 provides the data-driven foundation needed to align long-term education with evolving job market trends.

1.3. Objectives of the Task 2.2

Task 2.2 focuses on in-depth analysis of the necessary skills, competencies, and essential job profiles required for the long-term growth and resilience of the aerospace and defence industry. By pinpointing existing and emerging skills gaps across the sector, this task directly supports the overarching objective of Work Package 2 to bridge industry demands with EU educational offerings. The core output of this task culminates in a dynamic, continually updated Skills Intelligence Body of Knowledge, which establishes a standardized taxonomy and ontology of concepts, terms, and activities defining the professional domain in alignment with relevant learned societies and industry standards.

1.4. Definition of Body of Knowledge

A Body of Knowledge (BoK) is a structured, organised, and agreed set of knowledge related to a specific domain, encompassing key concepts, technologies, skills, methods, processes, and professional roles characteristic of a given field of activity. It serves as a reference knowledge base that defines the scope of knowledge and competencies required within a particular sector or profession.

A BoK is typically developed through the analysis of multiple information sources, such as scientific literature, industry reports, professional standards, educational programmes,

labour market data, and expert input. Its purpose is to organise knowledge in a way that supports activities such as skills development, the design of education and training programmes, the identification of skills gaps, and professional development.

In the context of the AEROFUSE project, the Body of Knowledge refers to a systematically organised collection of information related to technologies, skills, job profiles, and development trends in the aerospace sector. Its role is to support the analysis of sectoral skills needs and to provide a foundation for the development of a sectoral skills strategy, education and training programmes, and other initiatives aimed at addressing current and future labour market needs.

1.5. Purpose of Deliverable D2.2 – Body of Knowledge: Methodologies

The purpose of Deliverable **D2.2** – Body of Knowledge: Methodologies is to present the methodological framework developed within the AEROFUSE project for building a sectoral Skills Intelligence system and a Body of Knowledge (BoK) for the European aerospace sector. The report describes the research approach used to identify, collect, and analyse data related to skills, job profiles, technologies, and skills gaps across four key subsectors: satellite and spacecraft manufacturing and operations, aircraft production and Maintenance, Repair and Overhaul (MRO), and airports.

The document outlines the conceptual framework and methodological approach used to develop the Body of Knowledge, combining traditional research methods, such as the analysis of scientific and industry sources, with data-driven and AI-supported analytical tools. This approach enables the systematic collection and processing of information from multiple sources, including scientific publications, industry reports, European projects, job postings, and expert input from sector stakeholders. Following the mixed methods logic described by Creswell and Creswell (2023), qualitative insights from documents and experts are integrated with structured and quantifiable data on technologies, skills, competences, and job roles. This integration allows the results to be compared, synthesised, and interpreted in a more comprehensive way, supporting the identification of current and future competence needs for the Body of Knowledge.

The report also explains how knowledge is structured and classified within the Body of Knowledge, including the use of existing skills classification systems such as the ESCO taxonomy, as well as an ontology-based approach to organising concepts, relationships, and professional roles relevant to the aerospace sector.

The methodology presented in this deliverable provides the foundation for further analytical activities in the project, particularly for the preparation of subsequent Body of Knowledge reports addressing technologies, workforce demographics, and skills shortages, as well as for the development of the Sectoral Skills Strategy and the design of new education and training programmes in the later work packages of the AEROFUSE project.

1.6. Role of the Body of Knowledge in the AEROFUSE Project

The Body of Knowledge (BoK) is one of the key analytical components of the AEROFUSE project, serving as a structured and systematic repository of knowledge related to skills, technologies, job profiles, and development trends in the European aerospace sector. Its primary role is to create a coherent knowledge base that enables a better understanding of the current and future skills needs of the sector, as well as the identification of existing gaps between labour market demand and the educational offer.

The Body of Knowledge gathers and integrates information from multiple sources, including scientific publications, industry reports, European projects, job advertisements, and insights from experts representing both industry and academia. This enables the development of a comprehensive overview of the skills and professional roles required across the four main subsectors addressed by the project: satellite and spacecraft manufacturing and operations, aircraft production and Maintenance, Repair and Overhaul (MRO), and airports.

The BoK also functions as a supporting tool for the skills intelligence system developed within the project. It enables the identification of key technological, managerial, and transversal (soft) skills, as well as the analysis of their relevance in the context of digital transformation, the green transition, and geopolitical changes affecting the aerospace sector.

The knowledge collected within the Body of Knowledge provides a foundation for subsequent project activities. The results of the analyses conducted within the BoK are used to support the development of the Sectoral Skills Strategy, the design of new education and training programmes, and the strengthening of collaboration between industry and educational institutions. Furthermore, the BoK lays the groundwork for the future skills observatory in the aerospace sector, which aims to ensure the long-term monitoring and updating of skills needs beyond the duration of the project.

1.7. Link between Task 2.2 and Deliverable D2.2

Deliverable **D2.2** – Body of Knowledge: Methodologies reports on the results of **Task 2.2** – Sectoral Skills Intelligence to map current shortages of skills and job profiles within Work Package 2. **Task 2.2** focuses on developing a systematic analysis of skills, identifying key job profiles, and determining current skills shortages in the aerospace sector. In this context, report **D2.2** presents the methodological framework used to carry out these activities.

In particular, Deliverable **D2.2** describes the research approach applied in **Task 2.2** for collecting, processing, and analysing data related to skills and job roles. This includes both traditional methods of analysing scientific and industry sources and tools based on automated database searches and AI-supported analysis of online data. This methodology enables the identification of the most frequently requested skills, technologies, and job profiles in the project areas (satellite and spacecraft manufacturing and operations, aircraft production and Maintenance, Repair and Overhaul (MRO), and airports), as well as their classification according to the adopted analytical frameworks.

Therefore, report **D2.2** provides the methodological foundation for the development of the Body of Knowledge, which is one of the main outputs of **Task 2.2**. It defines the structure of the research process, the data sources, the methods of analysis, and the way knowledge is organised and classified within the BoK. The subsequent deliverables related to **Task 2.2** (D2.3 and its updates) will present the results obtained through the application of this methodology, including analyses of technologies, workforce demographics, and skills shortages in the aerospace sector (**Figure 1**).

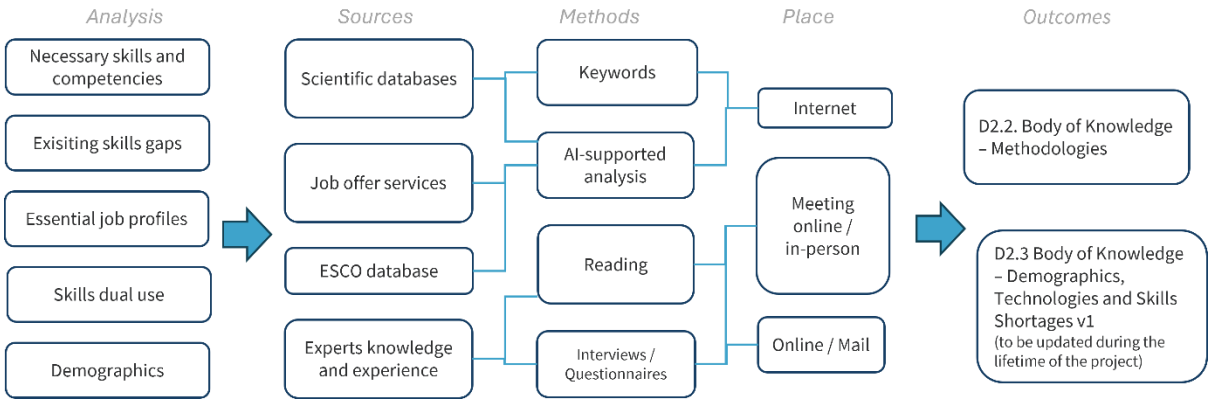

Figure 1 Activities and deliverable in Task 2.2

In this way, **D2.2** serves as a document describing the methodological framework and analytical tools that enable the implementation of **Task 2.2** and the preparation of

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subsequent reports further developing the Body of Knowledge within the AEROFUSE project.

1.8. Link with other tasks of Work Package 2 and Deliverable D2.2

The different activities carried out within **WP2** contribute complementary perspectives to the development of the Body of Knowledge. **Task 2.1** provides contextual intelligence regarding external drivers affecting the aerospace sector. **Task 2.2** identifies technologies, skills, competences and occupational profiles. **Task 2.3** analyses the educational supply side through semantic curriculum mapping and educational intelligence methodologies. **Task 2.4** contributes knowledge resources and best practices from European initiatives, while **Task 2.5** transforms these findings into strategic recommendations for the aerospace skills ecosystem. Therefore, the **Task 2.2** is directly linked to the activities within Work Package 2 (WP2), which focuses on analysing the current state of the aerospace sector and identifying skills gaps.

Deliverable **D2.2** serves as the central document that collects and outlines the overarching methodology for skills intelligence and emerging trends in the aerospace sector.

First, it ensures a coherent methodological framework across both **Task 2.1** and **Task 2.2**, which share a unified focus on identifying essential skills, technologies, and job roles, but approach the research by gathering data from distinctly different sources. While **Task 2.1** examines the macro-level influence of external drivers—such as the post-pandemic recovery, digital and green transformations, and geopolitical shifts—**Task 2.2** investigates current industry demands by analysing direct data from job offers, targeted industry surveys, and scientific literature.

By establishing this coherent, multi-source approach, **D2.2** successfully integrates the high-level contextual insights generated in **Task 2.1** with the practical, direct industry data gathered in **Task 2.2**. This synthesis allows the deliverable to provide a comprehensive, evidence-based outline of the research methodologies used, ultimately culminating in robust preliminary findings on the specific hard and soft skills required across the satellite manufacturing, aircraft production, and airport subsectors.

Task 2.4 is directly linked to Deliverable **D2.2** by enriching the Body of Knowledge (BoK) with forward-looking technological intelligence derived from the broader EU knowledge offer, including EU-funded projects, patents, and industry reports. While **D2.2** establishes the overarching methodological framework for Skills Intelligence and outlines initial

findings on required hard and soft skills across the key subsectors (satellite manufacturing, aircraft production, MRO, and airports), **Task 2.4** applies these content analysis methodologies to examine the technological innovations and best practices shaping the industry.

In essence, while **D2.2** documents the methodology and preliminary findings regarding what skills, job profiles, and competency gaps exist (drawing heavily on labour market evidence from **Task 2.2**), **Task 2.4** provides the explanatory context of why these gaps are emerging. By systematically analysing R&D and innovation data, **Task 2.4** feeds essential technological depth into the BoK framework established in **D2.2**, ensuring that the project's skills intelligence captures not only current market demand but also the technological trends driving future competency requirements.

Next, the **Task 2.3** complements the Skills Intelligence activities carried out in **Task 2.2** by analysing the educational and training supply side of the aerospace ecosystem. While **Task 2.2** focuses on identifying current and emerging skills requirements, job profiles, and competence shortages from an industry perspective, **Task 2.3** investigates how these skills are currently addressed within Higher Education Institutions (HEIs) and Vocational Education and Training (VET) programs across Europe.

The objective of **Task 2.3** is to provide a structured understanding of the existing educational offer, identifying strengths, gaps, overlaps, and potential misalignments between training provision and industry needs. This analysis contributes directly to the expansion of the Body of Knowledge (BoK) framework outlined in Deliverable **D2.2** by incorporating the educational supply-side dimension into the aerospace skills ecosystem.

Task 2.3 relies on the outputs and methodologies established within **Task 2.2** and documented in Deliverable **D2.2** particularly the identification of relevant skills, competences, technologies, and occupational profiles. These outputs serve as the baseline to define semantic categories, keyword taxonomies, and analytical frameworks for the systematic analysis of educational programs.

At the same time, the outcomes of **Task 2.3** provide valuable input for **Task 2.5**, supporting the development of the Sector Skills Strategy through evidence-based recommendations regarding curriculum adaptation, educational priorities, and future competence development needs. Furthermore, the methodologies developed within **Task 2.3** align with the AI-supported semantic techniques and knowledge mapping approaches set out in

Deliverable **D2.2**, establishing a scalable framework for the future analysis of educational programs.

Together, **Tasks 2.2 and 2.3** — supported by the methodological baseline in Deliverable **D2.2** — establish both the demand-side and supply-side perspectives of the aerospace skills ecosystem, providing a comprehensive foundation for evidence-based curriculum design and sectoral skills strategy development.

Furthermore, the **Task 2.4** is directly linked to Deliverable **D2.2** by enriching the Body of Knowledge (BoK) with forward-looking technological intelligence derived from the broader EU knowledge offer, including EU-funded projects, patents, and industry reports. While **D2.2** establishes the overarching methodological framework for Skills Intelligence and outlines initial findings on required hard and soft skills across the key subsectors (satellite manufacturing, aircraft production, MRO, and airports), **Task 2.4** applies these content analysis methodologies to examine the technological innovations and best practices shaping the industry.

While **D2.2** documents the methodology and preliminary findings regarding what skills, job profiles, and competency gaps exist (drawing heavily on labour market evidence from **Task 2.2**), **Task 2.4** provides the explanatory context of why these gaps are emerging. By systematically analysing R&D and innovation data, **Task 2.4** feeds essential technological depth into the BoK framework established in **D2.2**, ensuring that the project's skills intelligence captures not only current market demand but also the technological trends driving future competency requirements.

Finally, **Task 2.5** is linked to Deliverable **D2.2** as it serves as the strategic application of the research, methodologies, and baseline evidence compiled within the Body of Knowledge (BoK). While **D2.2** establishes the overall methodological framework and provides structured data on skills, competences, job roles, emerging technologies, and market dynamics across the four aerospace subsectors, **Task 2.**5 relies on this comprehensive foundation to design, develop, and validate the Sector Skills Strategy.

Deliverable **D2.2** supplies the evidence regarding what skill shortages and competency gaps exist, which **Task 2.5** directly converts into actionable solutions. By grounding its strategic preparation, action development, and stakeholder validation in the BoK framework set out in **D2.2**, **Task 2.5** ensures that the resulting Sector Skills Strategy is data-driven, targeted, and capable of effectively addressing current and future aerospace workforce needs.

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1.9. Links with Other Work Packages

Deliverable **D2.2** – Body of Knowledge: Methodologies is closely connected with several work packages in the AEROFUSE project, as it provides the methodological foundation for the development of the Skills Intelligence system and the Body of Knowledge (BoK). The framework and research methods described in this deliverable support subsequent analytical, strategic, and educational activities carried out across the project.

The outcomes of the methodological framework presented in **D2.2** will also provide important input to Work Package 3 (WP3). In particular, they will support the development of the Sectoral Skills Strategy initiated under **Task 2.5** and further developed under **Task 3.4**, as well as the analysis on future skills needs in the aerospace sector. The data collection and analytical methods defined in the Body of Knowledge support the identification of emerging competencies and future job profiles, which are further analysed in WP3 when looking towards future developments in the sector (e.g. 2030–2035).

In addition, the results generated through the application of the BoK methodology contribute to the work carried out in Work Packages 4 and 5, which focus on the design and delivery of education and training programmes. The identification of key technologies, skills gaps, and professional roles provides the evidence base required for developing new curricula, training modules, and educational tools tailored to the needs of the aerospace sector.

Furthermore, the insights derived from the Body of Knowledge support the activities of Work Package 6, which aims to strengthen cooperation between industry and educational institutions and facilitate connections between students and the labour market.

Additionally, T7.3 Community Building and Validation of project Outputs will be mobilised to validate the inputs for the skills strategy.

Finally, the methodological framework and knowledge structure developed in **D2.2** contribute to Work Package 8, which aims to ensure the long-term sustainability of the project results. In particular, the Body of Knowledge will serve as one of the core components of the planned AEROFUSE Skills Observatory, enabling the continuous monitoring and updating of skills needs in the aerospace sector beyond the duration of the project (**Figure 2**).

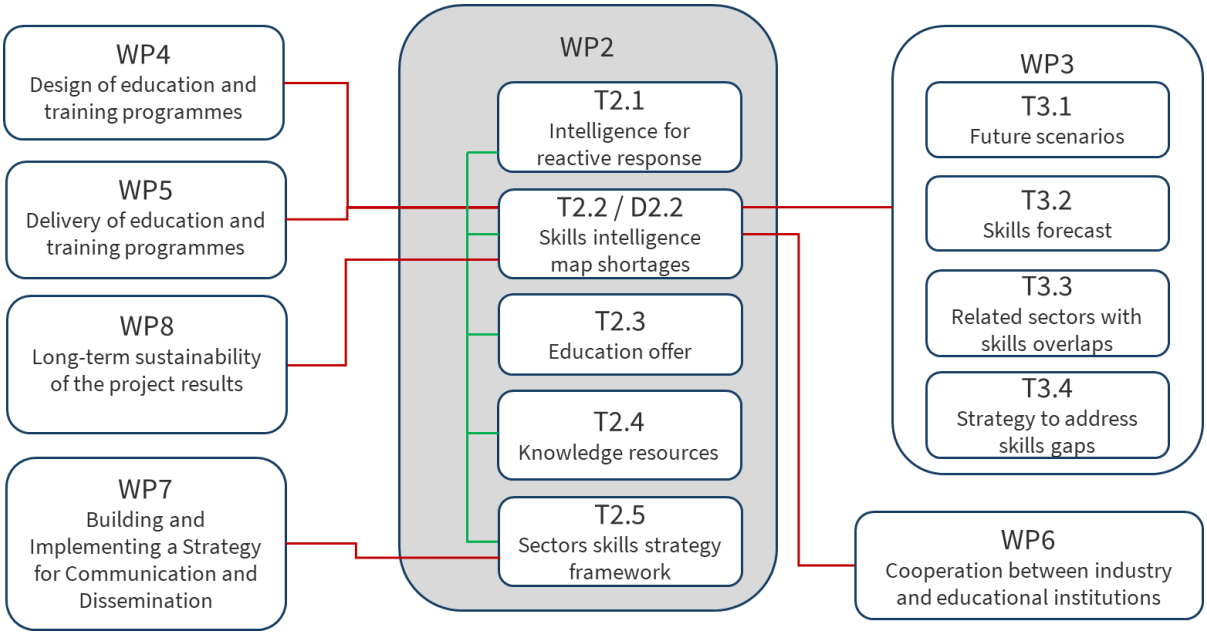

Figure 2 Link of D2.2 across project activities

As the methodological framework described in Deliverable **D2.2** constitutes the foundation of the AEROFUSE Skills Intelligence ecosystem the Body of Knowledge is not conceived as an isolated repository of information, but as an integrated knowledge layer connecting sectoral needs, educational provision, technological evolution and future workforce requirements.

The resulting Body of Knowledge serves as a central knowledge asset supporting the activities developed in WP3 to WP8, including future skills strategy development, curriculum design, pilot implementation, industry collaboration, validation activities and the establishment of the long-term AEROFUSE Skills Observatory.

2. Conceptual Framework for Skills Intelligence

2.1. Skills Intelligence in the Aerospace Sector

Skills intelligence refers to the systematic process of collecting, analysing, and interpreting data related to skills, qualifications, and labour market needs within a specific sector or economy. Its purpose is to provide reliable and up-to-date information that supports decision-making related to skills development, education systems, labour market policies, and strategic planning in economic sectors (Cedefop, n.d.).

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Skills intelligence is based on the analysis of various data sources, such as labour market statistics, job postings, industry reports, scientific publications, education and training programmes, and insights from experts and sector stakeholders, e.g. in the form of questionnaires, interviews. By integrating these data sources, it becomes possible to identify current and future skills needs, analyse gaps between the demand for skills and their supply, and monitor changes in employment structures and required qualifications.

In the aerospace sector, skills intelligence plays a particularly important role due to the rapid technological, regulatory, and market changes affecting the industry. Digital transformation, the development of deep-tech technologies, the green transition, and evolving geopolitical conditions are creating new skills requirements and reshaping existing job profiles.

In this context, skills intelligence enables the early identification of emerging technological trends and the related skills needs in the aerospace sector. This supports the alignment of education and training programmes with industry requirements, facilitates workforce development planning, and helps companies prepare for upcoming technological and organisational changes.

Through the systematic analysis of data, skills intelligence also contributes to reducing mismatches between the supply of and demand for skills, supporting the development of a more flexible and resilient labour market in the aerospace sector. As a result, it represents an important tool for supporting the sector's transformation and strengthening its long-term competitiveness in Europe.

2.2. Scope of the Body of Knowledge

The Body of Knowledge (BoK) developed within the AEROFUSE project represents a comprehensive and structured collection of knowledge related to key elements of the labour market in the aerospace sector. The scope of the BoK covers several interrelated areas that together enable a better understanding of the sector's skills needs and the identification of existing and emerging skills gaps.

One of the core elements is **skills**, understood as specific practical and technical abilities required to perform particular professional tasks. Within the Body of Knowledge, both specialised technical skills related to aerospace technologies and transversal skills (e.g. teamwork, problem-solving) are identified and analysed.

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Another important element is **competences**, which represent a broader combination of knowledge, skills, and attitudes that enable individuals to perform professional tasks effectively. The analysis of competences makes it possible to define requirements associated with different levels of responsibility and specialisation within the aerospace sector.

ESCO provides a common reference terminology for skills, competences, qualifications, and occupations relevant to the European labour market and education and training systems (European Commission, n.d.).

A further key component of the BoK is the identification and analysis of **job roles**. The Body of Knowledge maps key professional roles present in the aerospace sector and analyses their responsibilities, required competences, and relationships with specific technologies and industrial processes.

An important part of the BoK also involves the analysis of technologies that shape the development of the aerospace sector. This includes both currently used technologies applied in satellite and spacecraft manufacturing and operations, aircraft production and Maintenance, Repair and Overhaul (MRO), and airports, as well as emerging technologies that may influence future skills needs within the sector.

Finally, the scope of the Body of Knowledge includes the analysis of workforce **demographics** in the aerospace sector. This involves examining factors such as age structure, gender distribution, professional experience, and education levels of employees. Such analysis helps to better understand workforce availability challenges, identify potential sources of socio-demographic disadvantage affecting access to employment and skills development, and supports planning for future human resource development in the sector.

2.3. Sub-sectors Covered

The analyses conducted within the Body of Knowledge focus on four key subsectors of the European aerospace industry, which have been identified as particularly relevant from the perspective of technological transformation and evolving skills needs.

The **first** subsector is **satellite and other spacecrafts manufacturing and operating**, which includes the design, development, and production of satellite systems and their components. This subsector is characterised by rapid technological advancement and the growing importance of satellite systems across many areas of the economy.

The second subsector is **aircraft production and Maintenance, Repair and Overhaul (MRO)**, covering the design, development, and manufacturing of aircraft and their systems (e.g. aircraft propulsion systems), as well as activities related to aircraft maintenance, repair, and modernisation. In this area, particular attention is given to new material technologies, the digitalisation of production processes, sustainability aspects related to resource efficiency, emissions reduction, and lifecycle-oriented maintenance, and the development of more sustainable aviation technologies. This area plays a critical role in ensuring aviation safety and operational efficiency across the sector.

The **third** subsector included in the analysis is **airports**, which represent a key component of the air transport system. The analysis addresses skills related to airport operations management, safety and security, logistics, sustainable airport operations, energy efficiency, emissions reduction, and the implementation of new technologies in airport infrastructure.

2.4. ESCO Taxonomy and Ontology Approach

To ensure consistency and comparability of the analyses conducted within the Body of Knowledge, the AEROFUSE project uses the ESCO taxonomy (European Skills, Competences, Qualifications and Occupations). ESCO is the European classification system for skills, competences, qualifications, and occupations, enabling a standardised description of professional roles and skills across different sectors of the economy.

The use of the **ESCO taxonomy** allows for the standardisation of identified skills and job profiles and facilitates the alignment of project results with existing European qualification frameworks and education systems. This also makes the project results more accessible and usable for educational institutions, industry stakeholders, and policymakers.

In addition, the project adopts an **ontology-based approach**, which involves building a structured system of concepts and relationships describing skills, technologies, and job roles in the aerospace sector. The ontology enables the representation of connections between different elements of the Body of Knowledge, such as technologies, required competences, and related job profiles.

This approach allows the development of a coherent and systematic model of knowledge about skills in the aerospace sector, which can support labour market analysis, the design of education and training programmes, and the development of strategies for skills development in the sector.

3. Methodological Framework

3.1. Research Objectives and Research Questions

The objective of the research conducted within the AEROFUSE project is to identify and analyse key technologies, skills, competences, and job roles relevant to the aerospace and defence sectors, with particular attention to the subsectors of aircraft production and Maintenance, Repair and Overhaul (MRO), airports, and the satellite/space industry. The research aims to provide a comprehensive understanding of the current and emerging workforce needs of the sector.

A specific objective of the study is to identify skills gaps and mismatches between labour market demand and the available workforce competences, as well as to analyse how technological developments, digital transformation, green transition, and geopolitical changes influence the evolution of required skills and professional roles.

The research also aims to determine which technologies, skills, and job roles are currently important for organisations operating in the aerospace and defence sectors, and which are expected to gain importance in the next five years. This perspective allows the identification of emerging trends that may affect workforce development and education systems in the near future.

Another important objective of the research is to support the development of the Body of Knowledge (BoK) for the aerospace sector by creating a structured mapping of technologies, skills, and job roles based on multiple data sources. The results of the analysis contribute to identifying new or evolving competences and occupations that may not yet be fully reflected in existing classification systems such as ESCO (European Skills, Competences, Qualifications and Occupations).

Ultimately, the research provides an evidence base that supports the development of sectoral skills strategies, education and training programmes, and workforce development initiatives, contributing to better alignment between the needs of the aerospace industry and the European education and training systems.

The following research questions were adopted:

RQ1. Which emerging **technologies** in the aerospace and defence sectors are beginning to shape, and will continue to shape over the next five years, the demand for new skills and job roles?

RQ2. Which **skills** and **competences** are currently emerging as important for organisations operating in the aerospace and defence sectors, and which will be required in the coming years in response to emerging technologies?

RQ3. Which competences are the most **difficult to recruit** on the labour market due to their scarcity or high level of specialisation, and where are the most significant skills gaps observed?

RQ4. Which new **job roles** are emerging and may appear in the aerospace and defence sectors in the coming years?

RQ5. To what extent are the identified technologies, skills, and job roles already reflected in the **ESCO** classification, and which of them represent new or emerging competence areas?

The methodology presented in the following sections of this report enables answering the research questions formulated above.

3.2. Overall Research Design

The methodology applied in the AEROFUSE project for the development of the Body of Knowledge (BoK) is based on a comprehensive research approach that enables the identification, analysis, and interpretation of information related to technologies, skills, and job profiles in the aerospace sector (**Figure 3**). Due to the complexity of the analysed domain and the dynamic nature of changes occurring in the sector, an approach combining multiple data sources and research methods has been adopted, allowing for more reliable and comprehensive results.

One of the key elements of the applied methodology is the **multi-source approach**, which involves the use of **multiple types of information sources**. The use of diverse data sources enables a more complete understanding of the skills needs of the aerospace sector and supports the identification of both current and emerging trends.

An important element of the methodology is also **data triangulation**, which consists of comparing and verifying information obtained from different sources and through different research methods. This approach increases the reliability of the analytical results and reduces the risk of misinterpretations that may arise from relying on a single data source.

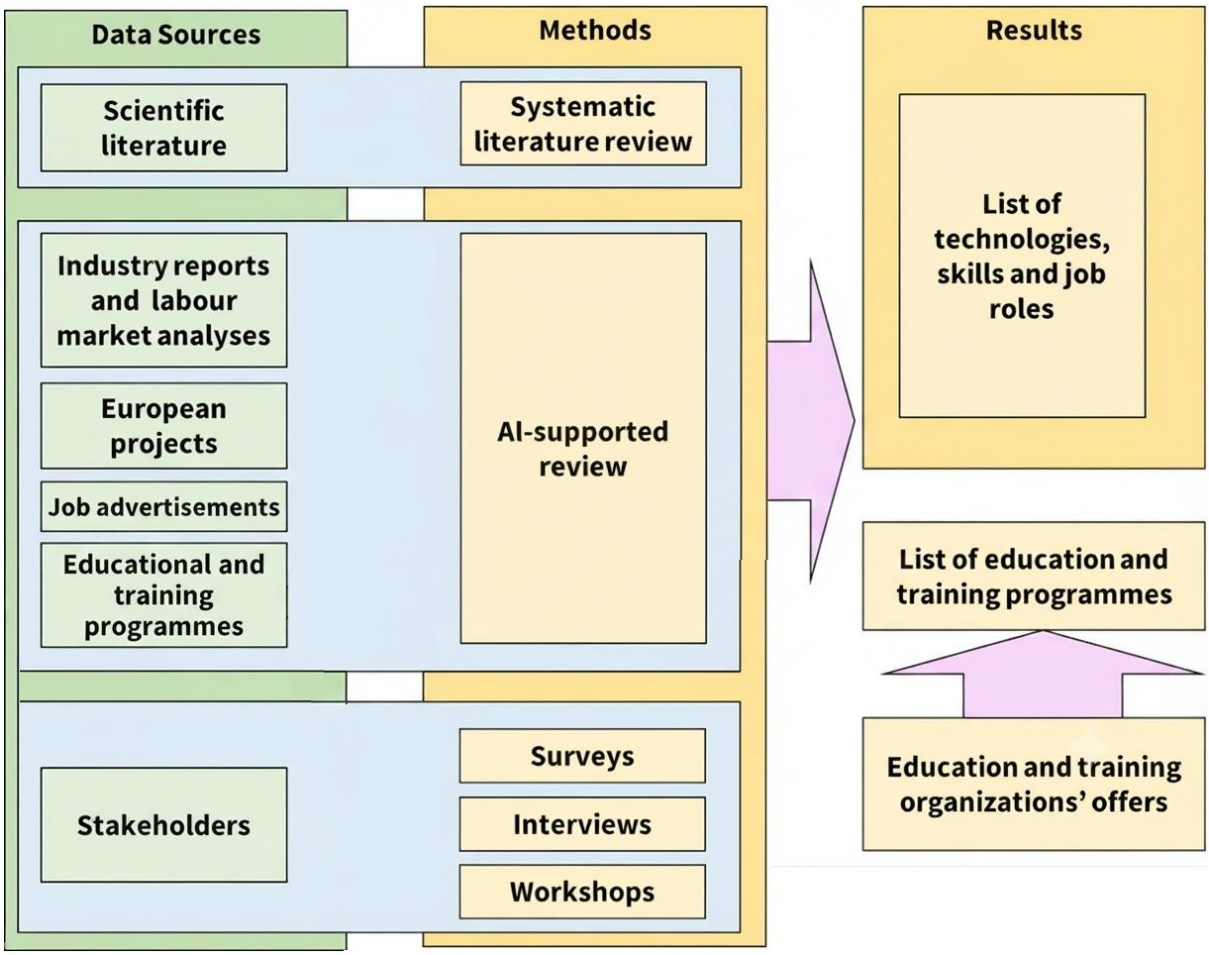

Figure 3 Structure of the Overall Research Design

The adopted research approach also combines quantitative and qualitative methods. **Quantitative methods** are primarily used to analyse large datasets, such as job advertisements, scientific publications, and information on education and training programmes. These methods allow the identification of the frequency of occurrence of specific skills, technologies, or job profiles. **Qualitative methods**, such as expert analysis, interviews, and consultations with sector stakeholders, enable a deeper interpretation of the results and a better understanding of the context of changes taking place in the aerospace sector.

The combination of these approaches makes it possible to develop a coherent and reliable overview of the sector's skills needs and provides a solid foundation for further analyses carried out within the Body of Knowledge, as well as for the development of recommendations related to skills development and education and training programmes in the aerospace sector.

3.3. AI-Supported Data Mining Approach

To increase the efficiency and scope of the analyses carried out in the development of the Body of Knowledge (BoK) within the AEROFUSE project, an approach based on AI-supported data mining has been applied. This approach enables the processing of large datasets originating from diverse sources and the identification of patterns, trends, and relationships that may be difficult to detect using only traditional analytical methods.

AI-supported data mining is primarily used for the automated search and analysis of large collections of textual data, such as scientific publications, industry reports, documents from European projects, and job advertisements. Tools based on Natural Language Processing (NLP) techniques enable the identification of frequently occurring skills, technologies, sector-specific terms, and the relationships between them. This makes it possible to quickly obtain information about current skills trends and emerging job profiles in the aerospace sector.

The application of AI-supported data mining methods also enables the systematic organisation and classification of the collected information. Processes involving data mining and AI-supported analyses are conducted in accordance with the European Commission's guidelines on the responsible use of artificial intelligence tools (European Commission, 2026a, 2026b). The results of automated analyses are subsequently verified by project experts, allowing the combination of algorithmic analysis with the expert knowledge of the project partners. This approach increases the reliability of the obtained results, reduces the risk of data misinterpretation, and represents an important complement to the traditional research methods used in the project.

3.4. Data Sources

The following data sources were used in the research:

• **Scientific literature** – one of the primary data sources used in the analyses conducted for the development of the Body of Knowledge. In particular, well-established scientific publication databases such as Web of Science and Scopus were used, providing access to peer-reviewed scientific articles, research reports, and publications related to technological developments, trends in the aerospace sector, and associated skills.

• **Industry reports** and **labour market analyses**, which provide a broader context regarding employment trends, demand for specialists, and changes in the skills structure within the aerospace sector.

• **Labour market data** (*labour market intelligence*) – primarily including job advertisements, which allow the identification of current skills requirements demanded by companies operating in the aerospace sector.

• **European projects** and other knowledge resources developed within EU initiatives, including patents. The analysis of results from projects funded by the European Union, as well as technological reports and strategic documents, makes it possible to identify the latest technological development directions and initiatives related to skills development in the sector.

• **Stakeholders** from the aerospace sector, particularly companies, industry organisations, public administration and experts representing both industry and academia. Their knowledge and experience make it possible to validate analytical results and provide a practical perspective on the actual skills needs of the sector. Cooperation with stakeholders also supports a better understanding of the challenges faced by the sector and its future development directions.

3.5. Data Collection Methods

3.5.1. Systematic literature review

Scientific publications, by their nature, examine new technologies, industry developments, education, and future challenges. It is assumed that their content is related, either directly or implicitly, to the skills and competencies within the researched areas. The peer-review process in major databases (e.g. Web of Science, Scopus) ensures the credibility of the observations and conclusions, which facilitates the identification of skills and competencies required in modern industry and emerging job roles.

The literature review constituted one of the fundamental elements of the data collection process. In the first stage, a systematic search of the literature was conducted in reputable scientific publication databases, in particular Web of Science and Scopus, **Figure 4**. The main search topics covered Skills and Competences within areas of Aerospace and Defence – a wider scope adopted to prevent omitting publications that could prove essential to the project. The search was carried out in publications titles, abstracts, and keywords using a set of keywords related to the analysed research (project) area, including in particular:

- “aerospace AND skills”,
- “defence AND skills”,
- “space AND skills”

- "aviation AND skills",
- "airports AND skills".

Further, selection criteria covered region of Europe (including Türkiye, Georgia, Azerbaijan, Armenia), and publications written in English language which were published since 2020. Finally, duplicates and publications not available in full version were excluded from the search results. This allowed the analysis to focus on the most recent studies and current trends related to skills demand in the aerospace sector of European region.

In the process of literature filtering, the main keywords (**Figure 4**) may be further replaced by their synonyms to ensure that important publications are included (see **Table 1**).

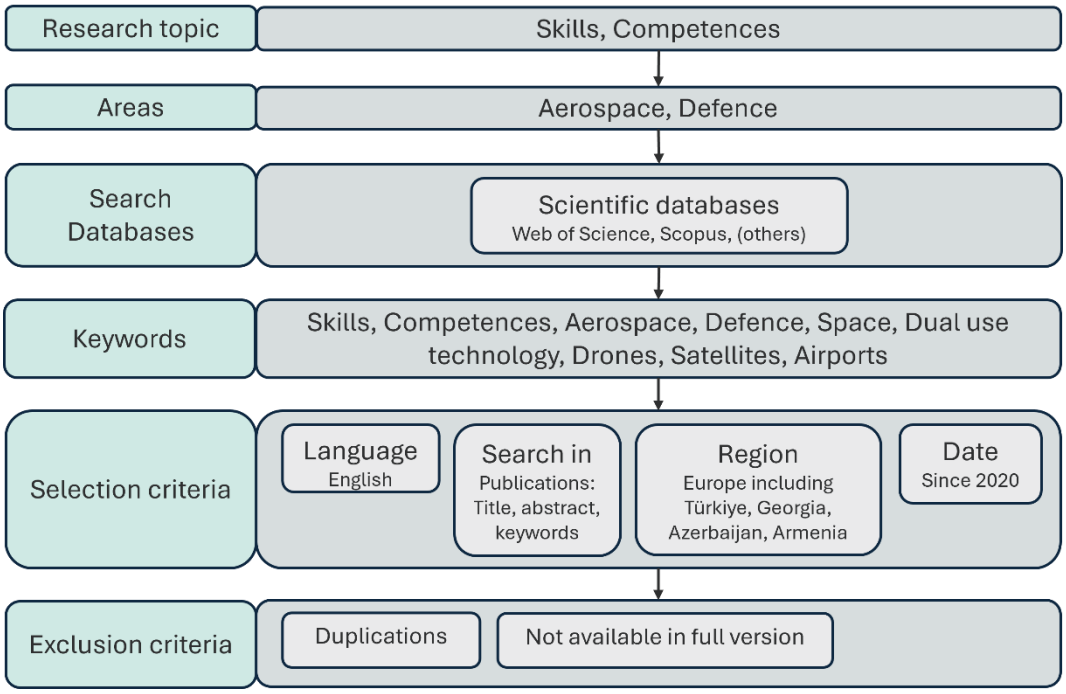

Figure 4 Systematic literature filtering process

Table 1 Keywords and synonyms for literature filtering

Keyword	**Synonyms**
Skills	Abilities, Proficiencies, Expertise, Technical capabilities, Aptitudes
Competences	Competencies, Qualifications, Skill sets, Know-how, Proficiency standards
Aerospace	Aeronautics, Aviation and space sector, Air and space engineering
Defence/Defense	National security, Military technology

Keyword	Synonyms
Space	Exo-atmospheric, Orbital environment, Extra-terrestrial space
Dual use technology	Civil-military technology, Multi-purpose technology, Cross-sectoral technology,
Drones	UAV, UAS, RPAS, Uncrewed aircraft, Autonomous aerial platforms
Satellites	Orbital craft, Spacecraft, Space-based platforms, Artificial satellites, Satellite manufacturing, Constellations
Airports	Aerodromes, Aviation hubs, Vertiports
Aviation	Flight, Flying, Aeronautics, Air transport. Air travel, Aircraft

The literature review was based primarily on bibliographic databases, including Web of Science and Scopus. In addition, publisher websites, such as MDPI, were used as supplementary sources to identify relevant open access publications and to access full-text articles where appropriate. The searching engines of Web of Science and Scopus were used in the following way:

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- **Web of Science**: The articles filtering process involved selecting publication years ranging from the COVID-19 pandemic (2020), when significant changes occurred in the aviation world, to the present (2026). Additionally, articles written in English from the European continent (not just the European Union) were selected. Keywords were matched according to the **Table 1** , as illustrated in the **Figure 5**.
- **Scopus**: The database search was conducted in an analogous manner with respect to keywords, publication dates, and geographical regions, **Figure 6**.

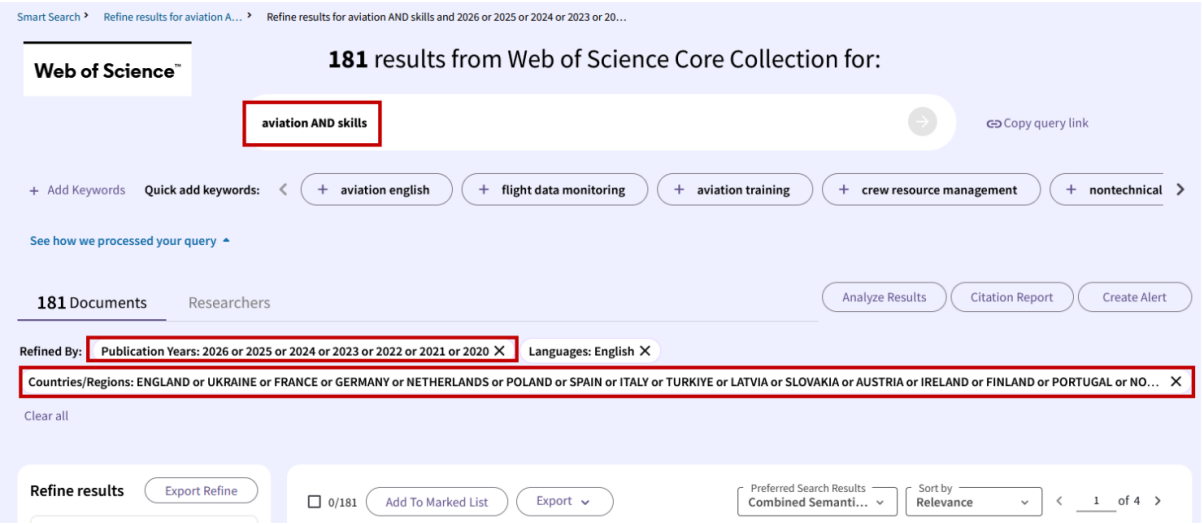

Figure 5 Example article search on WoS

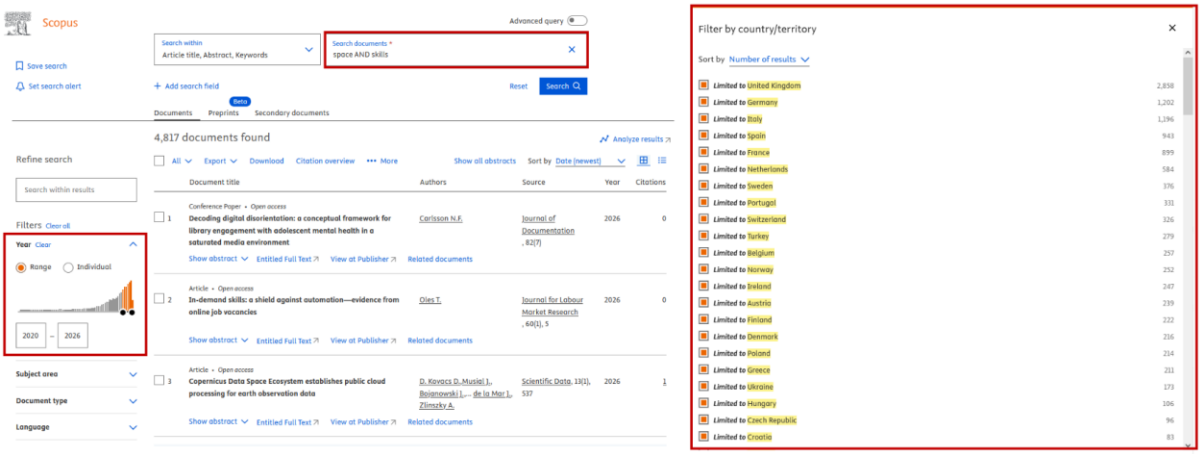

Figure 6 Example article search on Scopus

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The search results were stored as a list of publications, and full version of articles. The list of publications included articles data such as authors, title, journal name, volume/issue/pages, year, keywords, DOI and link, and other data relevant to specific database, **Figure 7**.

Publ	Authors	Bo	Bo	Bo	Aut	Bo	Gro	Article Title		Source Title
J	Roy, S; Do				Ro			Classroom to Workplace: Knowledge and Skills	OK	JOURNAL OF AEROSPACE
J	Bowkett, C				Bo			MNC effects? A cross-national comparison of t	NA	EUROPEAN JOURNAL OF
C	Escapa, A;		Ch		Es			BACHELOR'S THESIS PROCESS IN AEROSPACE		14TH INTERNATIONAL TE
C	Castaldi, P				Ca			Investigation of the student-professor interaction and		IFAC PAPERSONLINE

Figure 7 . Example of publications list searched in Web of Science database

In the next stage, a preliminary screening of the search results was conducted through the analysis of publication titles and abstracts. Publications related to areas not directly connected with the objectives of the study were excluded from the analysis, particularly those that did not address issues related to skills, labour market developments, education, or technological development in the aerospace sector.

Following the screening process, publications that addressed topics such as technological changes in the aerospace sector, the development of new technical and transversal skills, the digital and green transformation of the sector, and challenges related to workforce development and education systems supporting the aerospace industry were selected for further analysis. The list of selected scientific publications, as well as the preliminary AI-based analyses aimed at extracting workforce requirements such as emerging job roles, core technologies, and key competencies, is provided in **Annex 1**.

3.5.2. Identification of Industry Reports and Labour Market Sources

As part of the data collection process, industry reports and labour market data relevant to the aerospace sector and related industries were identified and collected. The aim of this step was to gather up-to-date information on employment trends, skills demand, workforce development, and technological changes affecting the structure of skills in the sector.

Reports were primarily searched for in publicly available online sources, including the websites of industry organisations, public institutions, international organisations, research institutes, and consulting companies. During the search process, sets of keywords related to the analysed topic were used, such as “aviation”, “aerospace”, “space”, “defence”, “competences”, “report”, “skills”, “aerospace skills”, “aviation workforce”, “skills gap”,

"labour market", as well as combinations of these terms with the names of specific subsectors of the aerospace sector.

The search focused mainly on reports published in recent years, in order to capture the most up-to-date analyses related to skills changes resulting from the technological, digital, and green transformation of the sector. Particular attention was given to reports prepared by European institutions, industry organisations, and analytical centres specialising in labour market analysis and technological development.

After identifying potentially relevant documents, a preliminary screening of reports was conducted based on their titles, abstracts, and thematic scope. Reports selected for further analysis were primarily those containing information on skills demand, the identification of skills gaps, changes in employment structures, and forecasts for the development of the aerospace sector. The list of reports selected for further analysis is provided in **Annex 2**.

The analysis of industry reports and labour market sources formed the basis for the development of the **survey questionnaire**.

3.5.3. Survey

The survey was conducted using a questionnaire prepared in the EU Survey tool and distributed to respondents via email. In collaboration with project partners, invitations were sent to the 67 organisations. The sample represents key industry sectors, comprising 38 companies from Space, 24 from Aerospace, 2 from Aerospace/Defence, 2 from Airports, and 1 from Aeronautical Sector. **Annex 3** contains the list of companies whose representatives were invited to complete the survey.

The questionnaire consists of seven main sections:

1. **Respondent and organisational profile** - type of organisation, organisation's role in the supply chain, size of organisation, and sector and role of respondent in organisation,
2. **External drivers of technological and workforce change** - This section includes questions related to technologies, skills and competences, and job roles which are influenced by COVID-19, digital transformation, deep-tech developments, green transition, and geopolitical developments.
3. **Technologies used or planned in the organisation** – This section identifies the technologies currently used within organisations as well as those expected to be adopted in the coming years.

4. **Skills and competences** – This section focuses on identifying key skills and competences that are currently important for organisations, difficult to recruit for, or expected to become more important in the near future.
5. **Job roles** – This section examines how key job roles within organisations are evolving, including changes in demand, upskilling requirements, and the emergence of new roles.
6. **Workforce needs** – This section explores major workforce-related challenges faced by organisations, including categories of workers that are difficult to recruit and the competences considered most important for organisational development.
7. **Training and skills development** – This section analyses training needs within organisations, including preferred training formats and areas where appropriate training programmes are currently difficult to access.

The questionnaire includes questions and predefined answer options, which were developed based on the results of the analyses of industry reports and labour market sources. The survey comprises a total of 39 questions, distributed across seven consecutive sections in the proportion of 6, 6, 6, 11, 6, 2, and 2 questions. Majority of these questions feature multiple response choices – both closed- and open-ended – specifically targeting key external factors, technologies, skills, job roles, workforce needs, and educational course formats.

Technologies, skills and job roles were grouped into the following categories:

- Digital & Data Technologies
- Cyber, Communications & Digital Infrastructure Technologies
- Autonomous, Robotic & System Technologies
- Space & Aviation Technologies
- Advanced Industrial & Materials Technologies
- Deep-Tech & Emerging Technologies

Additionally, in the section on skills, categories such as **operational or sector-specific skills** and **cross-cutting** and **professional skills** were distinguished.

The survey questionnaire is presented in **Annex 4**.

The survey has been ongoing since **19 March 2026**, and responses are still being collected. A total of 11 responses have been collected for initial analysis in this report.

The survey was conducted among the following stakeholder groups:

- Industry / companies (aerospace, defence, space, airport operators),
- Public sector / authorities,
- Education and training providers,
- Research organisations.

We aimed the following sectors:

- Aviation,
- Space,
- Defence-related aerospace.

We aimed to involve organizations representing the following roles within the supply chain:

- Original Equipment Manufacturer (OEM)
- Tier 1 supplier (direct supplier to OEM)
- Tier 2 / Tier 3 supplier (subcontractor)
- Maintenance, Repair and Overhaul (MRO) provider
- System integrator
- Component / parts manufacturer
- Raw materials supplier
- Technology / software provider
- Research and development (R&D)
- Education and skills development for industry
- Testing, certification or quality assurance body
- Airports / airport operations
- Logistics / distribution provider,

The survey was addressed to individuals holding the following roles within their organizations:

- Technical / operational role,
- Management / leadership role,
- Policy / strategy role,
- Training / HR / skills development role.

We aimed to reach organizations of different sizes, as well as public authorities.

3.5.4. Labour Market Data Collection

As part of the data collection process, labour market data were gathered through the review of online platforms specialising in job advertisements. Particular attention was given to

widely used professional networking and recruitment platforms, such as LinkedIn, which provide access to a large number of job postings from companies operating in the aerospace sector. These platforms allow for the identification of current workforce needs and the skills most frequently required by employers.

In addition to job platforms, the official websites of major aerospace companies operating in Europe were also reviewed. Many companies publish job vacancies directly on their corporate career pages, which makes it possible to capture additional job offers that may not always be listed on external recruitment platforms.

The search focused on job offers related to the aerospace sector and its key subsectors, enabling the identification of required skills, qualifications, and job roles currently sought by employers.

A detailed list of sources used to identify job postings is provided in **Annex 5**. Furthermore, **Table 2** presents the structure of the database developed to organise the information extracted from the analysed job advertisements.

Table 2 The structure of job postings the database

Company name	Country	Job position	Hard / technical skills	Soft skills	Formal level of education	Experience	Industry	Job offer service (link)	Date of access	Name of person who added (Project Partner)

The database includes key variables such as company name, country, job position, hard/technical skills, soft skills, formal level of education, required experience, and industry. In addition, the database records the source of the job offer (link to the job advertisement), the date of access, and the name of the project partner who collected the information. This structure enabled the systematic organisation and comparison of job market data across different companies and subsectors of the aerospace industry.

Table 3 presents a summary of the companies and job portals used to collect job offers. Job offers advertised in national languages were translated into English.

Table 3 List of job offers services

Name of the service or company	Type of the service	Main language

Leonardo	Aerospace industry	English, Italian

3.5.5. European Training and Educational offer collection

European training and educational offerings were collected to establish a representative dataset of aerospace-related educational programmes delivered by Higher Education Institutions (HEIs) and Vocational Education and Training (VET) providers.

The objective of this activity was to create a structured educational dataset that enables the systematic analysis of educational contents, learning outcomes, workload distribution, competence coverage and alignment with aerospace sector needs.

Considering the large diversity of educational systems across Europe, a progressive and scalable collection strategy was adopted. The first stage focused on the educational institutions participating in the AEROFUSE consortium, ensuring access to reliable programme documentation and facilitating methodological validation. In parallel, a pilot implementation was conducted at the University of Seville, which acts as the living laboratory for the development and validation of the complete methodological framework.

The collection process considered multiple educational sources, including:

- Programme descriptions.
- Course syllabi.
- Learning outcomes.
- Teaching guides.
- Module specifications.
- Public institutional information.
- Educational workload information (ECTS and contact hours).

Particular attention was given to aerospace-related educational programmes covering engineering, manufacturing, airport operations, air transport systems, digitalisation, sustainability and emerging aerospace technologies.

Due to the heterogeneity of formats and documentation structures, a pre-processing stage was implemented to normalise information extracted from PDF, DOC and web-based sources. This step ensured a homogeneous representation of educational contents regardless of their original format.

The collected information was organised into a structured educational dataset including:

- Institution type.
- Educational level.
- Programme title.
- Course title.
- Learning outcomes.
- Educational contents.
- Workload indicators.
- Specialisation domain.
- Geographic origin.

The resulting dataset constitutes the foundation for the subsequent semantic analysis activities described in **Section 3.6.5**.

The pilot implementation performed at the University of Seville currently includes the complete Aerospace Engineering Degree, covering four academic years, three specialisation tracks and approximately one hundred course units. This pilot provides a realistic large-scale educational environment for validating the methodologies developed within **Task 2.3**.

Figures 8-10 illustrate the complete educational intelligence workflow adopted in **Task 2.3**, covering the collection, normalisation, semantic enrichment and analysis of educational programmes. The framework transforms heterogeneous educational documentation into structured educational intelligence capable of supporting curriculum assessment, competence mapping and future educational recommendations.

The collected educational dataset constitutes the primary input for the semantic educational analysis framework described in **Section 3.6.5**.

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Figure 8 Complete educational intelligence pipeline. From educational documents to actionable curriculum recommendations

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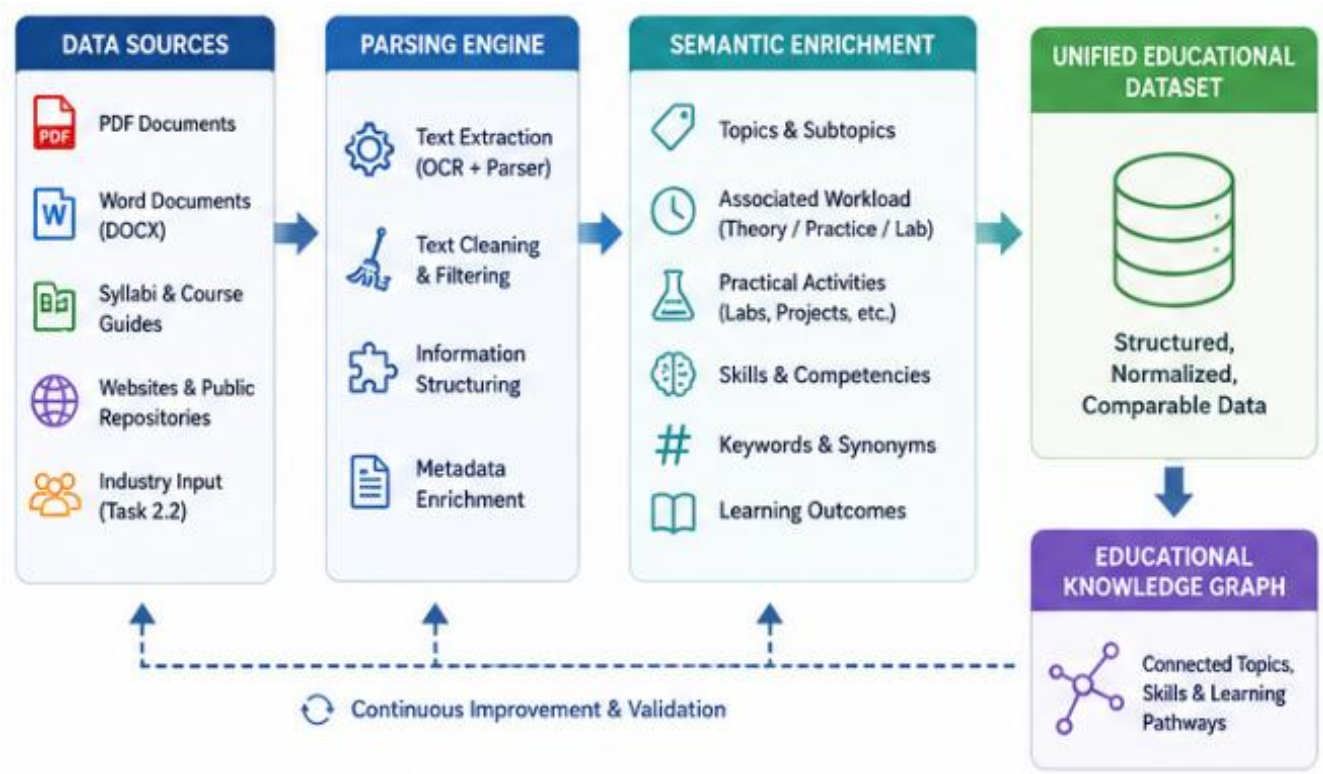

Figure 9 Educational data processing workflow. From w=raw documents to a unified educational knowledge graph

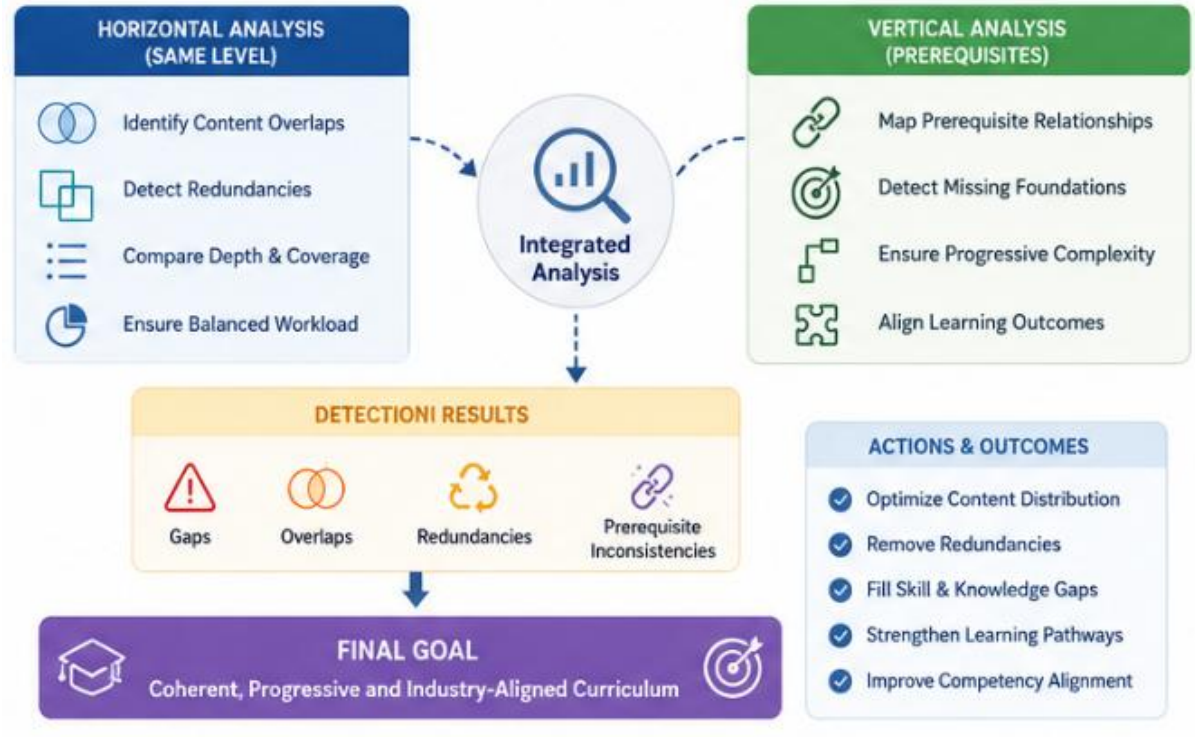

Figure 10 Cross-curriculum analysis. Vertical and horizontal insight for a coherent and optimized curriculum

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3.5.6. European Projects collection

As part of the data collection and analysis activities carried out within **Task 2.4** and **Task 2.5**, information from European projects relevant to the aerospace sector and skills development is systematically gathered and evaluated. The aim of this activity is to identify existing initiatives, research outcomes, and knowledge resources that address skills needs, technological developments, and workforce challenges in the aerospace sector and related industries.

The search focuses primarily on projects funded under European Union programmes, including research, innovation, and skills development initiatives. Particular attention is given to projects addressing topics such as technological transformation, digitalisation, green transition, workforce development, and skills gaps in sectors related to aerospace, defence, aviation, and space.

Project information is collected from publicly available databases and online platforms that provide access to EU-funded project results and descriptions. These sources typically include project objectives, expected outcomes, participating organisations, and links to publications and reports produced within the projects.

Within **Task 2.4**, the collected project data is reviewed in order to identify relevant methodologies, findings, and best practices related to skills intelligence, workforce development, and the identification of emerging technologies and competencies. This step allows the project team to build upon existing knowledge and avoid duplication of previous research efforts.

The list of identified related European projects is presented in **Table 4**.

Table 4 List of the identified European projects

Project title	**Duration (years)**
SPACE4GEO Large-scale Skills Partnership on Space Data, Services and Applicatio	2023 – ongoing initiative
ASTRAIOS - Analysis of Skills, Training, Research and Innovation Opportunities in Space	2023 - 2025
SpaceSUITE - Space downstream Skills development and User uptake through Innovative curricula in Training and Education	2024 - 2028

Project title	Duration (years)
EO4GEO	2018 - 2022
STARS*EU - Strategic Alliance for Regional Transition	2022 - ongoing
Alliance for Strategic Skills addressing Emerging Technologies in Defence, ASSETs+	2020 - 2024

The analysis of European projects also contribute to identifying complementarities between AEROFUSE and other initiatives, ensuring that the methodologies and results developed within the project are aligned with ongoing European efforts in the field of skills development and technological innovation in the aerospace sector.

3.5.7. Interviews

As part of the data collection process, semi-structured interviews with selected experts and stakeholders from the aerospace sector were conducted. The objective of these interviews was to complement the information obtained through literature review, industry reports, labour market data, and survey results with expert insights and qualitative perspectives on skills needs, technological developments, and workforce challenges in the sector.

The interviews were carried out with representatives of industry, research organisations, education and training institutions, and sectoral organisations involved in aerospace-related activities. Participants were selected based on their professional experience, expertise in the sector, and involvement in workforce development, technological innovation, or education and training activities relevant to the aerospace industry.

A semi-structured interview format was used, allowing the discussion to follow a predefined set of thematic areas while also enabling respondents to elaborate on specific issues based on their experience and expertise. The interview questions focused on topics such as current and emerging skills needs, technological trends, challenges in recruiting qualified personnel, and future workforce requirements in the aerospace sector.

The list of sample interview questions is presented in **Annex 6**. A form for interviews registration is presented in **Annex 7**.

3.5.8. ESCO database collection

The ESCO database (European Skills, Competences, Qualifications and Occupations) was integrated and is continuously used as a complementary methodological component of the data collection and analysis process. Its role is to support the structuring, validation, and classification of skills, competences, and job roles identified through other sources, including the literature review, industry reports, survey results, labour market data, European projects, and interviews.

As part of the methodology, the ESCO dataset was downloaded from the official European Commission repository: https://esco.ec.europa.eu/en/use-esco/download (**Figure 11**).

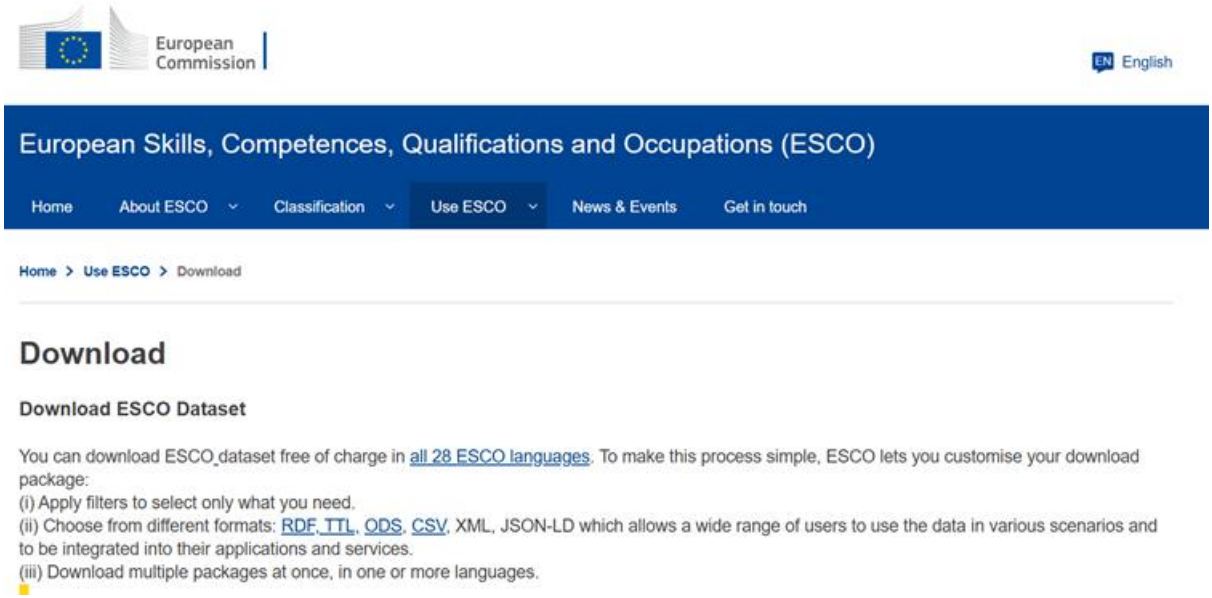

Figure 11 ESCO database download option

The ESCO dataset provides a structured and standardised European taxonomy linking occupations with the skills and competences required to perform them (**Figure 12**). Its use ensures alignment with recognised European classification frameworks and enables comparability with existing labour market and education systems.

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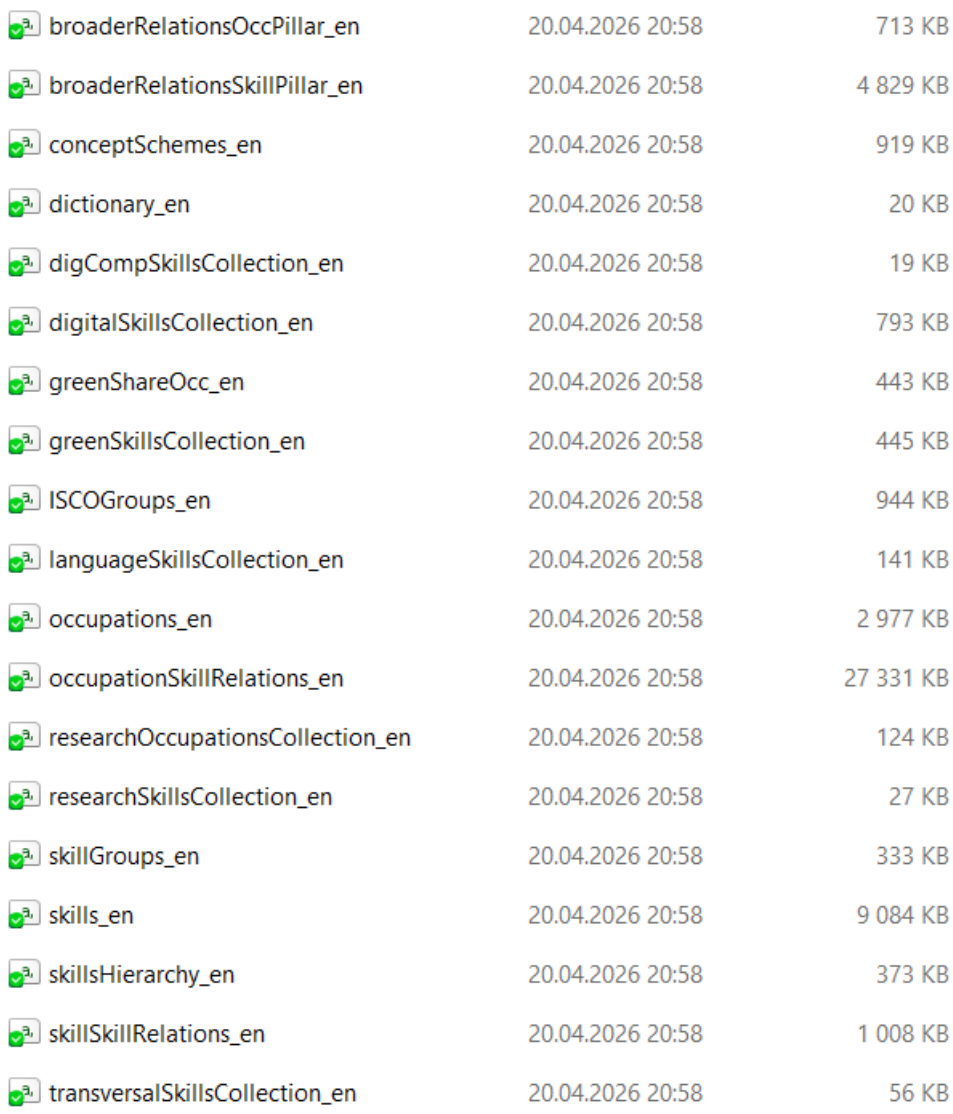

Figure 12 ESCO taxonomy related files

The analysis is based on a systematic review of ESCO occupational profiles and associated skills descriptions relevant to the aerospace, aviation, space, and defence sectors. Particular attention is continuously given to occupations related to engineering, manufacturing, maintenance, operations, digital technologies, and system integration.

Following data acquisition, a dedicated algorithmic approach was developed and is applied throughout the project to analyse the ESCO dataset (**Figure 13**). The algorithm is used to systematically search and extract occupations, skills, and competence-related keywords

relevant to the analysed domains. The search process will rely on predefined sets of keywords (and their synonyms) derived from previous stages of the research.

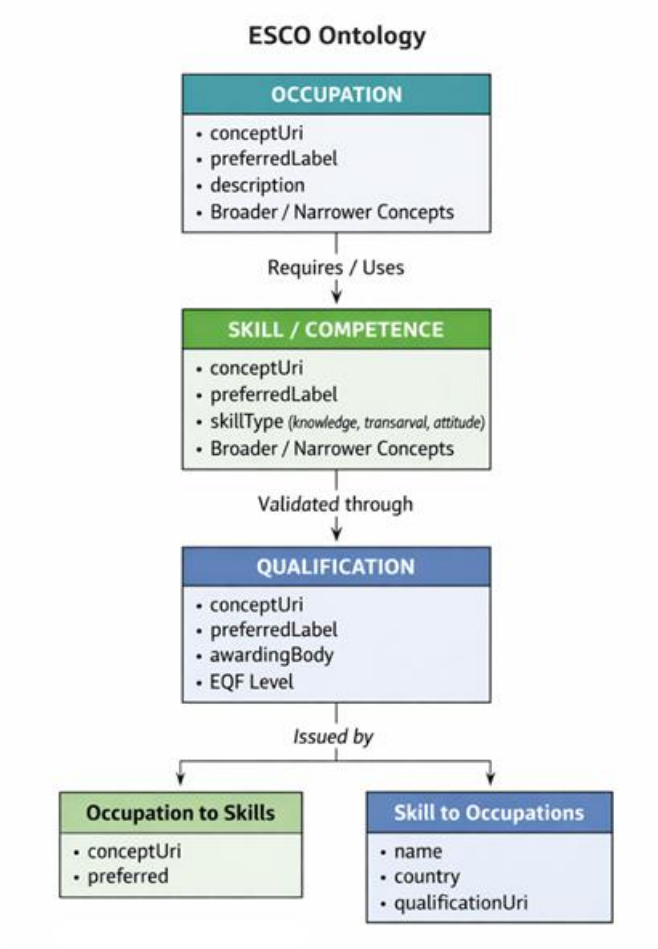

Figure 13 Data acquisition algorithm

The main keywords include, in particular:

- Skills, Competences (e.g. abilities, expertise, qualifications, skill sets, know-how),

- Aerospace, Aviation, Space, Defence,
- Airports,
- Dual-use technologies,
- Drones (UAV, UAS, RPAS),
- Satellites and space systems,

- as well as technology-related domains such as Digital & Data Technologies, Cyber & Communication, Autonomous Systems, Advanced Manufacturing, and Emerging/Deep-Tech technologies.

The algorithm will enable:

- identification of occupations associated with selected technological domains and competence areas,
- detection of related skills and competence clusters,
- grouping of occupations into job families and identification of closely related specialisations,
- mapping relationships between skills, competences, and job roles across sectors.

In practice, the ESCO framework is used to map identified technologies, skills, and job roles against existing classifications. This will allows verification of whether findings from other data sources are reflected in established ESCO categories and helps organise them within a structured taxonomy.

The comparison also enables the identification of gaps in current classifications, particularly in areas related to emerging technologies such as digital transformation, advanced manufacturing, and autonomous systems. As a result, the analysis will continuously support the identification of new or evolving competences that may require further recognition within European skills frameworks.

Overall, the ESCO-based analysis will ensure coherence, comparability, and standardisation of the results, while providing a structured overview of occupational ecosystems. It will also support the identification of both existing and emerging skills and job roles, contributing to the development of a comprehensive and scalable skills intelligence model for the aerospace sector.

3.6. Collected data analysis

The data analysis process followed a multi-stage approach, combining evidence from multiple sources in order to identify key technologies, skills, and job roles relevant to the aerospace and defence sectors.

In the first stage, industry reports and labour market sources were analysed to identify an initial set of technologies, skills, and job roles relevant to the sector. The results of this

preliminary analysis were used as a basis for developing the survey questionnaire, ensuring that the questions reflected current industry trends and labour market needs.

In the next stage, the results of the survey were analysed and compared with findings obtained from other data sources. In particular, the technologies identified through the analysis of industry reports and labour market sources were compared with the results of the systematic literature review, labour market data collected from job advertisements, results of European projects, and insights gathered through interviews with sector experts.

This comparative analysis allowed the identification of technologies, skills, and job roles that are currently important for the aerospace and defence industry, as well as those expected to become significant within the next five years.

Data collected from the different sources were cross-checked, compared, and aggregated in order to ensure consistency and reliability of the findings. The integration of multiple sources enabled a more comprehensive understanding of current and emerging workforce needs in the sector.

Based on the aggregated results, a mapping of technologies, skills, and job roles was developed. This mapping was subsequently compared with the ESCO database (European Skills, Competences, Qualifications and Occupations) in order to identify new or emerging competences and job roles that may not yet be fully represented in the existing ESCO classification.

3.6.1. Literature analysis

The primary objective of this methodological framework is the systematic identification of key project areas, specifically focusing on emerging technologies, critical skills, developing industrial branches, and evolving job roles within the aerospace and defence sectors. This objective is pursued through a multi-stage approach that integrates a systematic literature review (SLR) with AI-supported analysis and qualitative expert assessment. By combining these methods, the research ensures a comprehensive capture of both the quantitative trends in the academic landscape and the qualitative nuances of industrial evolution, **Figure 14**.

The first phase of the process involves the systematic recording and mapping of the scientific publications retrieved from the databases. Each entry is documented according to predefined keyword clusters and the year of publication to track the temporal evolution of the field. Bibliometric analysis is then conducted using VOSviewer or equivalent software

to identify the frequency and co-occurrence of keywords within the aerospace and defence domains. This stage facilitates the creation of keyword networks, revealing the underlying relationships between specific technological advancements and the competencies required to support them.

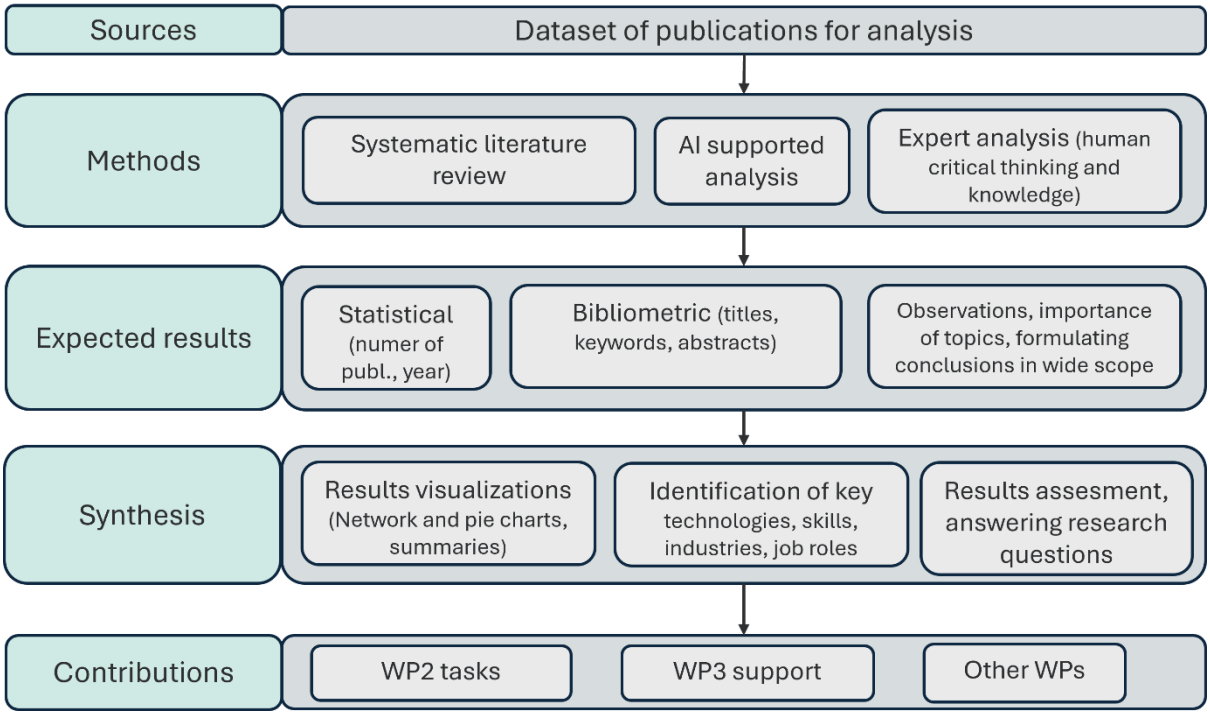

Figure 14 Literature analysis methodology

Building upon this bibliometric foundation, AI-supported tools are utilised to perform a more granular analysis of titles, keywords, and abstracts. This phase involves the development of unique, specialised prompts designed to extract nuanced information regarding industrial trends and emerging job profiles. The AI-driven screening facilitates the processing of large volumes of text, identifying patterns that may not be immediately apparent through manual review. The findings at this stage are further supported by data visualization techniques, including refined keyword networks and pie charts, which provide a statistical overview of the thematic distribution within the dataset.

The subsequent selection of papers for full-text reading follows a strict hierarchical protocol based on conformity with the project's specific scope. Publications are evaluated for relevance starting with the title, followed by keywords, and finally the abstract. Once the most suitable papers are identified, a deep analysis is conducted, focusing specifically on their research questions, aims, study samples, and main conclusions. To maintain analytical

efficiency, general literature reviews and standard methodology descriptions within the source publications are excluded. This allows the research team to apply expert knowledge and human judgment to assess the strategic importance of the conclusions within a wide industrial and academic scope.

In the final stage, the results from the bibliometric mapping, AI-supported extraction, and human expert analysis are synthesised into a coherent analytical framework. This synthesis involves a critical assessment and a comparative description of the findings to formulate robust conclusions. The final outputs are designed to provide direct answers to the primary research questions while offering a foundational contribution to other tasks and work packages within the project. This integrated approach ensures that the identified skills and technologies are accurately positioned to support the future development of the aerospace and defence workforce. Consequently, this literature analysis will contribute to answering research questions **RQ1**, **RQ2**, **RQ3**, and **RQ4** (**Section 3.1**).

3.6.2. Industry Reports and Labour Market Sources analysis

The collected reports were subjected to qualitative analysis aimed at identifying the technological trends, skills and competences important for industry and challenges related to workforce development in the aerospace sector. The methodology of the analysis is presented in **Figure 15**.

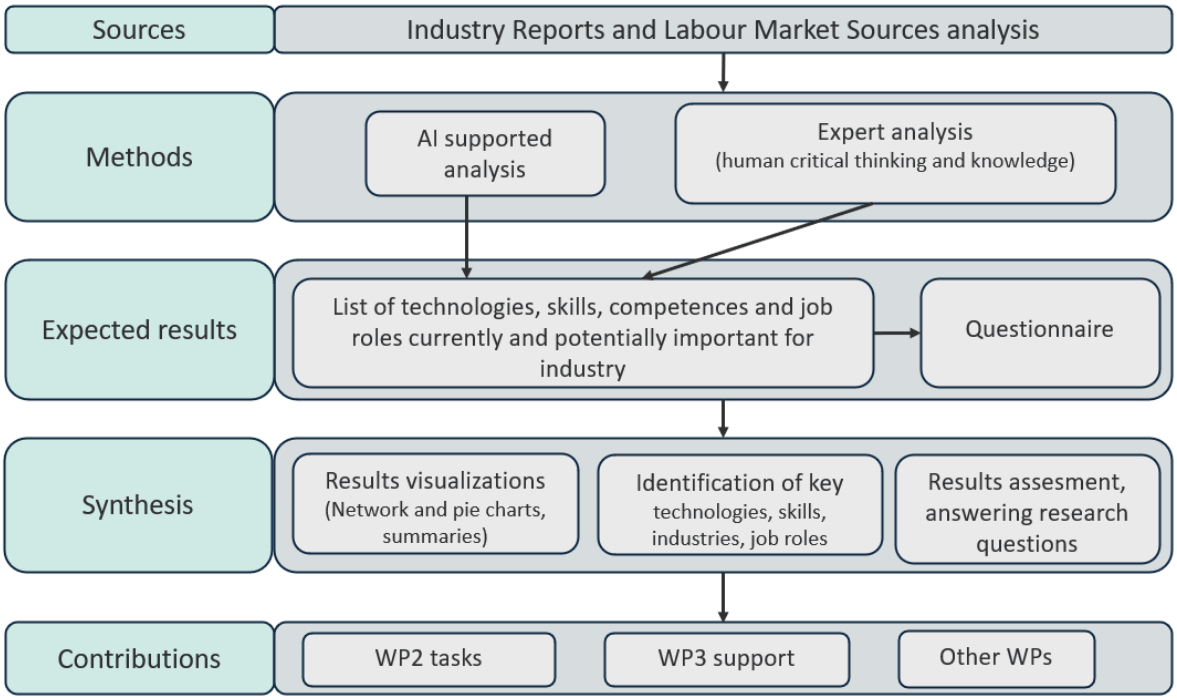

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Figure 15 Industry Reports and Labour Market Sources analysis

The analysis focused in particular on recurring references to skills demand, skills gaps, emerging and changing job roles, digital and green transformation, advanced manufacturing, automation, and labour market needs. The reports were analysed using predefined analytical categories, including technologies, skills and competences, skills gaps, job roles, workforce development needs, and key drivers of change. Particular attention was paid to findings that were directly relevant to the aerospace and defence sectors, as well as to conclusions indicating future workforce development priorities. This analysis constituted an important complement to the data obtained from scientific literature and other sources used in the study, enabling a broader understanding of industry-driven perspectives and practical labour market needs.

3.6.3. Survey analysis

The preliminary findings of the survey are presented in **Annex 8**. The collected data were subjected to quantitative analysis.

At the beginning, basic information on the survey participants, their organizations, and the countries they represented was summarised. The results based on the collected data from the sample of eleven survey responses are summarised in the figures presented below. The structure of the stakeholder groups is presented in **Figure 16**. Roles within the supply chain represented by organizations involved in the survey are presented in **Figure 17**. Size of organizations participated in the survey is presented in **Figure 18**. Sectors represented in the survey are presented in **Figure 19**. Roles held by survey participants within their organizations are presented in **Figure 20**.

		Answers	Ratio
Company		10	90.91 %
Public sector / authority		0	0 %
Education / training provider		0	0 %
Other (please specify)		1	9.09 %
No Answer		0	0 %

Figure 16 Structure of the stakeholder groups

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		Answers	Ratio
Original Equipment Manufacturer (OEM)		7	63.64 %
Tier 1 supplier (direct supplier to OEM)		3	27.27 %
Tier 2 / Tier 3 supplier (subcontractor)		1	9.09 %
Maintenance, Repair and Overhaul (MRO) provider		2	18.18 %
System integrator		2	18.18 %
Component / parts manufacturer		1	9.09 %
Raw materials supplier		1	9.09 %
Technology / software provider		3	27.27 %
Research and development (R&D)		2	18.18 %
Education and skills development for industry		3	27.27 %
Testing, certification or quality assurance body		1	9.09 %
Airports / airport operations		4	36.36 %
Logistics / distribution provider		2	18.18 %
Other (please specify)		1	9.09 %
No Answer		0	0 %

Figure 17 Supply chain roles represented by the organizations involved in the survey

		Answers	Ratio
Micro / Small (1-49 employees)		1	9.09 %
Medium (50-249 employees)		2	18.18 %
Large (250+ employees)		8	72.73 %
Public authority / not applicable		0	0 %
No Answer		0	0 %

Figure 18 Size of organizations participated in the survey

		Answers	Ratio
Aviation		9	81.82 %
Space		2	18.18 %
Defence-related aerospace		3	27.27 %
Other (please specify)		1	9.09 %
No Answer		0	0 %

Figure 19 Sectors represented in the survey

		Answers	Ratio
Technical / operational role		2	18.18 %
Management / leadership role		8	72.73 %
Policy / strategy role		0	0 %
Training / HR / skills development role		1	9.09 %
No Answer		0	0 %

Figure 20 Organizational roles held by individuals participating in the survey

The data on technologies currently used or planned by the organizations, as well as on skills and competences, are presented in **Annex 8**.

Other skills that are important in organizations today were also indicated. These included cross-functional collaboration, adaptability, problem-solving, compliance awareness, process discipline, and the ability to work effectively in an international and system-driven environment. Respondents also pointed to the importance of knowledge of regulations.

Other skills that are particularly difficult to recruit for in organizations were also indicated. These included the general availability of employees, specialised engineering skills, experienced technical specialists, advanced manufacturing expertise, systems integration capabilities, and the combination of technical knowledge with strong analytical and problem-solving skills. Respondents also pointed to talented cross-functional engineers as particularly difficult to recruit.

Other skills expected to become more important in organizations over the next five years were also indicated. These included change readiness, digital fluency, data-based decision-

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making, process improvement, systems thinking, and the ability to combine technical expertise with flexibility and continuous learning. Respondents also pointed to the growing importance of knowledge of regulations.

The data concerning job roles were summarised in **Annex 8**. Finally, categories of workers that are currently most difficult to recruit in organisations (**Figure 21**), types of competences that are most important for organisations (**Figure 22**) and Types of training formats that would be most useful for reskilling or upskilling employees in organisations (**Figure 23**) were summarised.

		Answers	Ratio
Production workers		3	27.27 %
Skilled trades workers (e.g. mechanics, electricians, welders, maintenance mechanics)		7	63.64 %
Technicians and technical specialists (e.g. avionics, electronics, laboratory or testing technicians)		5	45.45 %
Digital and IT specialists		4	36.36 %
Engineers		5	45.45 %
Research and development specialists		1	9.09 %
Other (please specify)		0	0 %
No Answer		0	0 %

Figure 21 Categories of workers are currently most difficult to recruit in organisations

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		Answers	Ratio
Technical and engineering competences		5	45.45 %
Digital, data and AI competences		7	63.64 %
Advanced manufacturing and industrial competences		5	45.45 %
Systems integration competences		6	54.55 %
Sustainability and environmental competences		1	9.09 %
Supply chain and logistics competences (including supply chain resilience)		4	36.36 %
Analytical and problem-solving competences		5	45.45 %
Collaboration and teamwork competences		4	36.36 %
Interdisciplinary competences (combining engineering, digital and operational skills)		3	27.27 %
Other (please specify)		0	0 %
No Answer		0	0 %

Figure 22 Types of competences, in responding to technological developments, are most important for organisations

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		Answers	Ratio
Micro-training sessions (up to 8 hours)		4	36.36 %
Short training courses (1–2 days)		9	81.82 %
Intensive training courses (up to 1 week)		6	54.55 %
Modular training programmes (several short modules over time)		5	45.45 %
Online training / e-learning courses		5	45.45 %
Professional certification programmes		3	27.27 %
Postgraduate studies (2 semesters)		3	27.27 %
Postgraduate studies (3 semesters or more)		3	27.27 %
Industry–academia training programmes		5	45.45 %
Other (please specify)		0	0 %
No Answer		0	0 %

Figure 23 Types of training formats that would be most useful for reskilling or upskilling employees in organisations

Additional analyses will be conducted based on the collected data to examine whether differences exist in the demand for technologies, skills and job roles depending on the organization's role in the supply chain, its size, and the sector in which it operates.

The conducted analyses will contribute to answering the research questions **RQ1**, **RQ2**, **RQ3**, and **RQ4**, see **Section 3.1**.

3.6.4. Labour Market Data analysis

This section will present a method for extracting data from job offers necessary to develop answers to the research questions presented in **Section 3.1**. Using AI chatbots, the following data sets are sought:

1. What technologies are used in the aerospace and defence sectors (**RQ1**)?
2. What skills and job roles are required for each technology (**RQ1, RQ4**)?
3. What skills and competences are required by the aerospace and defence sectors (**RQ2, RQ3**)?
4. What are the hard and soft skills required in satellite manufacturing, aircraft production and MRO, and airport subsectors (report requirement **D2.2**)?

A set of prompts was developed for the chatbot to extract the relevant data from the collected job offers. These prompts are presented in **Table 5**.

Table 5 Labour market analysis - chatbot prompts

Goal of the prompt	Prompt
Chatbot initialization	Speak English. Act like a data analyst. Analyse the attached file and give answers to the following questions.
Soft skills requirements	Present a list of soft skills that are required from job candidates. Then quantify how often each soft skill appears.
Soft skills requirements by country	Present a table showing which soft skills are required by employers in each country. Quantify how often each soft skill appears in a particular country. Group data intelligently by country. "IT" and "Italy" are one country. If a city appears next to the country name, ignore the city name and include only the country. The country names are in the "country" column.
Skills requirements	Present a list of skills (excluding soft skills) that are required from job candidates. Then quantify how often each skill appears.
Requested technologies	Provide a list of technologies that job candidates are required to be familiar with. Then, identify how frequently each technology appears. Also present a table with names of identified technologies (the name of grouped skills).

In **Tables 6-9**, the results of the data analysis for a subset of job offers from Leonardo are presented as an example. The copilot chatbot was used, GPT Open AI model, version available in MS Office 365 build 20260504.4.

Table 6 Example - soft skills requirements

Rank	Soft skill (grouped)	Occurrences
1	**Teamwork / Team working**	**111**
2	**Communication skills (written & verbal)**	**70**
3	**Problem-solving**	**53**
4	**Flexibility / Adaptability**	**50**
5	**Proactivity / Initiative**	**48**
6	Collaboration	13
7	Analytical / Critical thinking	12
8	Planning & Organization	12
9	Results orientation	9
10	Time management / Deadline management	8
11	Leadership	7
12	Autonomy / Independence	7
13	Creativity / Curiosity	7
14	Resilience / Stress management	6
15	Customer focus	3

Table 7 Soft skills requirements by country

Soft skill	Italy	United Kingdom
Teamwork / Team working	**41**	0

Soft skill	Italy	United Kingdom
Communication skills	**44**	4
Proactivity / Initiative	**30**	0
Problem-solving	**5**	1
Flexibility / Adaptability	9	0
Time management / Deadlines	9	0
Collaboration	4	0
Leadership	3	0
Resilience / Stress management	3	0
Results orientation	2	0
Creativity / Curiosity	2	0
Autonomy / Independence	1	1
Customer focus	1	0
Analytical / Critical thinking	0	1

Table 8 Example – hard skills requirements

Rank	Skill	Occurrences
1	Microsoft Excel	56
2	ERP systems (incl. SAP)	33
3	Git (version control)	28
4	RF (Radio Frequency)	27

Rank	Skill	Occurrences
5	SAP (Systems Applications and Products in Data Processing)	19
6	Linux	19
7	Java	18
8	SQL (general)	16
9	NIST (Cybersecurity framework)	14
10	Microsoft Word	12
11	Windows OS	12
12	MATLAB	11
13	C++	10
14	REST APIs	10
15	IBM DOORS (requirements)	10

Table 9 Required technologies

Technology Name
Programming Languages
Software Development Frameworks
Embedded & Real-Time Systems
Systems Engineering & MBSE
Requirements Management Tools
Cybersecurity Standards & Tools

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Technology Name
Networking & Telecommunications
RF & Microwave Technologies
Cloud Computing Platforms
Virtualization & Containerization
DevOps & CI/CD Tooling
Operating Systems
Databases & Data Management
Electronics & FPGA Design
Simulation & Modeling Tools
Engineering CAD & PLM Systems
Enterprise Systems (ERP, SAP)
Office & Reporting Technologies

3.6.5. European Training and Educational offer analysis

The collected training and educational offers will then be analysed in terms of their relevance to current and future workforce needs in the aerospace and defence sectors. The analysis will focus on whether the identified offers address technologies relevant to the sector, including those connected with digital transformation, green transition, advanced manufacturing, automation, artificial intelligence, data analysis, simulation, cybersecurity and other important areas.

The offers will also be assessed in terms of their ability to prepare participants for specific current and future job roles. This means that the analysis will examine whether participation in the identified education and training activities can support the

development of specific skills and competences required to perform selected roles in the aerospace and defence workforce.

The results of the analysis will support the identification of potential gaps in the educational offer and areas where new or updated learning pathways may be needed. They will also contribute to the development of the project's skills strategy and provide input for other tasks and work packages focused on workforce development, upskilling and reskilling. The analysis will contribute to answering the research questions **RQ2** and **RQ3** (**Section 3.1**).

Building upon the educational dataset described in **Section 3.5.5**, a semantic educational intelligence framework was developed to analyse curriculum structures, competence coverage and educational pathways. The analysis of the collected educational programs will be performed through a multi-stage methodology combining documentary analysis, semantic processing, educational mapping and expert validation.

The overall objective will help to identify how educational programs address the knowledge areas, skills and competences required by the aerospace sector, while simultaneously detecting curriculum gaps, overlaps, redundancies and opportunities for improvement. The methodological framework will be organised into four main phases.

Figure 24 presents the complete methodological workflow adopted within **Task 2.3**, from educational data acquisition and semantic structuring to curriculum analysis, AI-supported educational intelligence and the generation of actionable recommendations for future curriculum development.

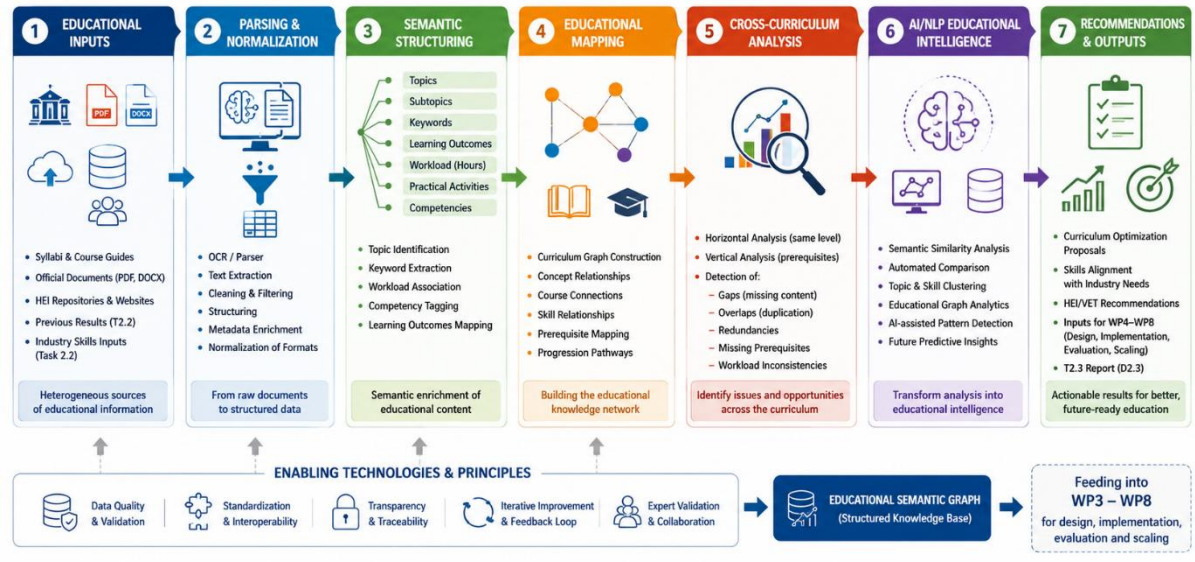

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Figure 24 Technical methodological pipeline of educational offer analysis. How the semantic educational analysis is performed

Phase 1 – Educational Content Extraction

Educational information will be extracted from program documentation, including syllabi, teaching guides, learning outcomes and course descriptions. Automated parsing procedures were used to process PDF and DOC documents and convert them into structured textual datasets. The extracted information will be normalized to remove formatting inconsistencies and facilitate subsequent analysis.

Phase 2 – Semantic Structuring and Educational Mapping

A semantic analysis process was applied to identify:

- Topics.
- Subtopics.
- Competence-related concepts.
- Educational keywords.
- Learning outcomes.

The methodology will incorporate a hierarchical keyword framework developed within T**ask 2.3** and aligned with the skills and competence categories identified in **Task 2.2**. Beyond simple keyword identification, the methodology will establish semantic relationships between educational concepts, allowing the creation of educational knowledge maps and curriculum graphs. Workload information will be associated with educational content whenever available, enabling estimation of educational depth and competence coverage.

The resulting semantic structures will be represented through an Educational Knowledge Graph, enabling the explicit representation of relationships between concepts, competences, learning outcomes, courses and academic progression pathways.

Phase 3 – Cross-Curriculum Analysis

Once educational programs are transformed into structured semantic representations, cross-analysis procedures will be performed to identify:

- Content overlaps.
- Curriculum redundancies.
- Missing prerequisite knowledge.

- Competence gaps.
- Fragmentation of educational pathways.

This analysis will be conducted both vertically (across academic years) and horizontally (across courses within the same academic level). The methodology will support the identification of educational inconsistencies that may affect student progression and competence acquisition.

Phase 4 – AI-Supported Educational Intelligence

The final phase prepares the educational dataset for future AI-supported analyses. The structured semantic representations generated throughout the process enable:

- Automated curriculum comparison.
- Semantic similarity analysis.
- Educational knowledge graph generation.
- Competence mapping.
- Future educational recommendation systems.

The methodology has been specifically designed to remain scalable across different HEI and VET institutions without requiring access to full lecture materials, relying instead on educational documentation that is typically available at institutional level.

To validate the applicability of the proposed framework, a pilot implementation will be conducted at the University of Seville using the complete Aerospace Engineering Degree (GIA) programme as a real-world educational testbed.

The proposed methodology will be validated through a pilot implementation carried out at the University of Seville within the Aerospace Engineering Degree programme. The pilot included the analysis of more than one hundred course units distributed across four academic years and three specialisation pathways.

The pilot implementation will enable the validation of the complete methodological workflow, including semantic extraction, workload association, concept mapping, prerequisite identification, horizontal and vertical curriculum analysis, and AI-supported educational intelligence mechanisms.

As illustrated in **Figure 25**, the pilot implementation will provide a large-scale validation environment covering the complete educational lifecycle of an aerospace engineer, from foundational sciences and engineering principles to advanced aerospace specialisation

modules. This will allow the methodology to be tested under realistic curriculum conditions, demonstrating its capability to detect structural educational issues and generate evidence-based recommendations for curriculum improvement. It is expected that the pilot will demonstrate the capability of the methodology to detect curriculum gaps, content overlaps, redundancies, missing prerequisite relationships and workload inconsistencies. These results will the suitability of the proposed framework as a scalable approach for future application across HEI and VET institutions participating in AEROFUSE.

The semantic framework developed in **Task 2.3** is directly aligned with the Skills Intelligence outputs generated in **Task 2.2**. Skills categories, competence clusters, occupational profiles and technological domains identified in **Task 2.2** are used as semantic reference layers for educational programme analysis.

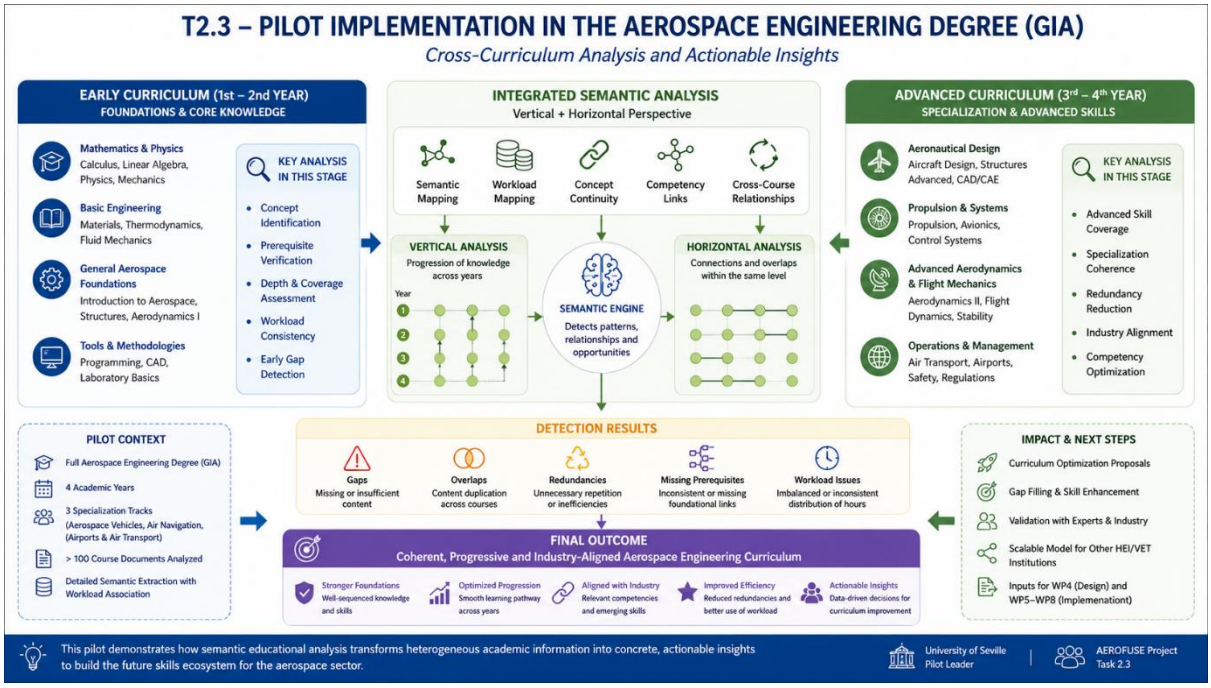

Figure 25 Pilot Implementation in the Aerospace Engineering Degree (University of Seville)

3.6.6. European Projects analysis

Within **Task 2.4** and **Task 2.5**, the skills strategies and roadmaps developed within other EU-funded projects are being analysed to gather information useful in designing the Skills Strategy to be produced and updated within the project (Deliverable D2.5 “Sector Skills Strategy for the satellite manufacturing, aircraft production and MRO, and airports

subsectors v1.0”). To capture the scope of work undertaken within **Work Package 2**, the preparatory activities and methodological approach associated with **Task 2.4** and **Task 2.5** have been included the report "D2.2 Body of knowledge: Methodologies".

In addition to such strategies, **Task 2.5** includes the review of other skills strategies and roadmaps relevant to the European job market.

The scope of such review is to extract good practices in terms of methodology and structure and sectoral information useful to build the Strategy. The review also aims at highlighting knowledge gaps which shall be covered by the project.

Given the relatively small number of EU projects already implemented in the field of skills for the aerospace sector, this analysis is carried out in the first place by manually reviewing and analysing the documents with a qualitative approach.

The relevant information extracted by available documents is systematised in fiches in the form of notes, while an aggregated qualitative analysis will summarise the findings of the documents’ review.

The EU-funded projects which are still ongoing, together with other relevant initiatives, will be monitored to integrate reports and results released within the lifetime of the Aerofuse project. The analysis will contribute to answering the research questions **RQ1**, **RQ2**, **RQ3**, **RQ4** and **RQ5**, (**Section 3.1**).

3.6.7. Interviews analysis

The analysis of the interview results will be conducted to verify, deepen and complement the findings obtained in the earlier stages of the research, including desk research, literature review, industry reports, labour market sources and survey results. The main objective of this stage will be to confront previously identified findings with expert opinions and to gain a better understanding of the context, importance and practical relevance of the identified technologies, skills, competences and job roles.

The interview material will be analysed using a qualitative approach. The responses will be reviewed according to predefined thematic areas corresponding to the main topics of the study, such as current and future skills needs, technological trends, skills gaps, recruitment challenges, changing job roles, education and training needs, and workforce development priorities. Particular attention will be paid to issues that confirm, refine or challenge the findings obtained from other sources.

The analysis will also aim to identify additional insights that may not have been fully captured through desk research or survey data. This will include expert observations on sector-specific challenges, practical barriers to skills development, emerging workforce needs, and possible differences between subsectors of the aerospace sector. Where relevant, similarities and differences between the opinions of different stakeholder groups will also be considered.

The results of the interview analysis will provide an important source of expert validation and contextual interpretation. They will support the formulation of more robust conclusions and contribute to answering the research questions. The findings will also provide input for other tasks and work packages within the project, particularly those related to the development of the sector skills strategy, training pathways, upskilling and reskilling activities. The analysis will contribute to answering the research questions **RQ1**, **RQ2**, **RQ3**, and **RQ4**, (**Section 3.1**).

3.6.8. ESCO database analysis

The ESCO database (European Skills, Competences, Qualifications and Occupations) was analysed in order to support the identification and classification of skills, competences, and job roles relevant to the aerospace and defence sectors. ESCO provides a structured and standardised European taxonomy that links occupations with the skills and competences required to perform them. Using this framework ensured that the results of the analysis are aligned with widely recognised European classifications and can be easily compared with existing labour market and education frameworks.

The ESCO database was used primarily as a reference framework for validating and structuring the skills and job roles identified through other data sources, including literature review, industry reports, labour market data, European projects, survey responses, and interviews. This step allowed the research team to map the identified technologies, skills, and job roles against existing ESCO occupations and skills categories.

In practice, the analysis involved reviewing ESCO occupational profiles and associated skills descriptions relevant to the aerospace, aviation, space, and defence-related industries. Particular attention was given to occupations linked to engineering, manufacturing, maintenance, operations, digital technologies, and system integration.

The comparison between the project findings and the ESCO database made it possible to identify skills and job roles already covered by existing ESCO classifications, as well as potential gaps where emerging technologies or new professional roles may not yet be fully

represented. This process also supported the identification of new or evolving competences related to digital transformation, advanced manufacturing, autonomous systems, and other technological developments affecting the aerospace sector.

The ESCO analysis therefore contributed to ensuring the consistency and comparability of the results, while also supporting the identification of emerging skills and occupations that may require further recognition within European skills frameworks. The analysis will contribute to answering the research question **RQ5** (**Section 3.1**).

To prepare valuable usage of ESCO data, a Python GUI script were created (**Figure 26**).

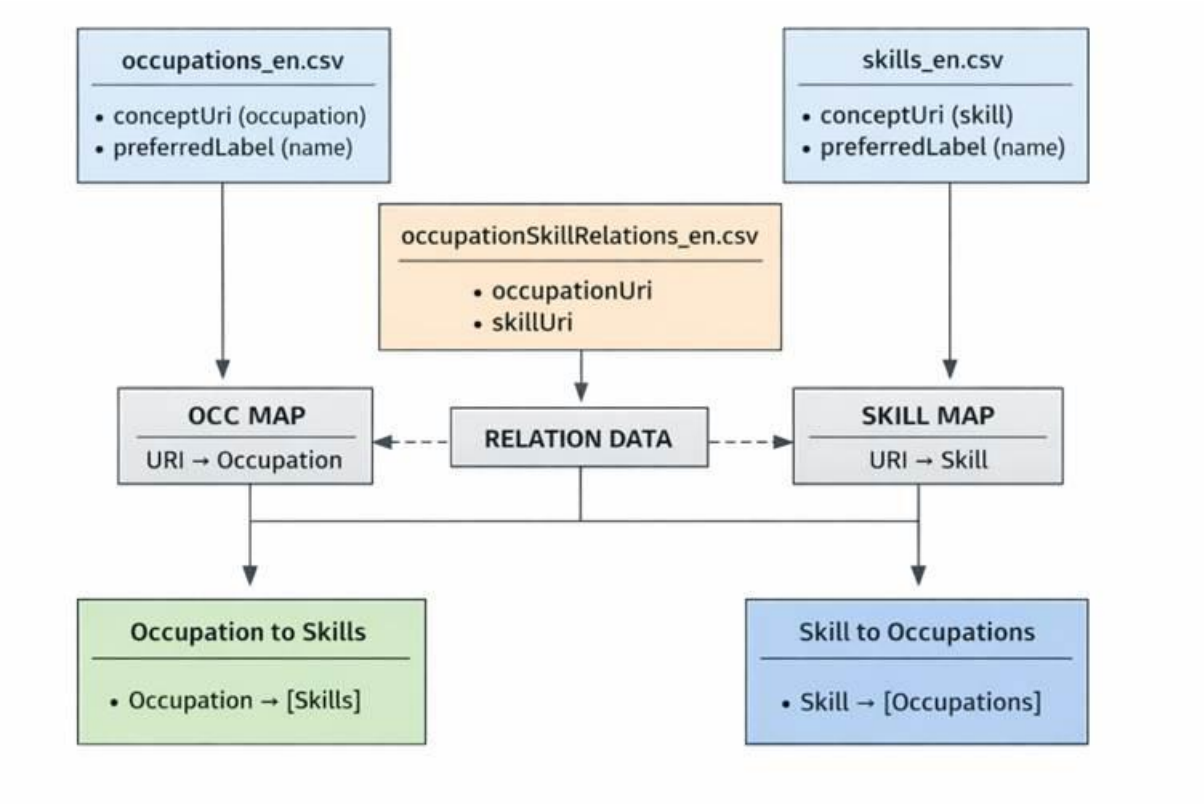

Figure 26 ESCO data analysis procedure

The developed Python script implements a desktop application that enables interactive browsing of ESCO data, specifically occupations, skills, and the relations between them. The application is based on the Tkinter – a graphical user interface (GUI) library – and relies on three ESCO CSV files as its primary input: a file containing occupations, a file containing skills, and a file describing occupation–skill relations. These files must include the concept URIs and preferred labels for both occupations and skills, as well as the corresponding URIs

linking them in the relations dataset. After the user selects a folder containing the required ESCO files, the application loads them into memory. Next, by using Pandas – a data analysis library – the application constructs two bidirectional mapping structures: one mapping each occupation to the list of skills associated with it, and another mapping each skill to the list of occupations in which it appears. These mappings are stored as dictionary-like containers that allow efficient lookup in both directions. Once the data is loaded, the user can perform text-based searches by entering a query and selecting whether the search should be performed among skills or occupations. The search mechanism is intentionally simple and relies on case-insensitive substring matching: any occupation or skill whose name contains the typed fragment is included in the results list. Selecting an item from the results triggers retrieval of all related elements from the precomputed mappings, which are then displayed in a separate panel. In this way, the application provides an immediate overview of the relationships between ESCO skills and occupations. The user may also copy both the search results and the detailed relations to the system clipboard. The output of the application therefore consists of two dynamically generated lists: the set of items matching the search query and the set of items linked to the selected element. The tool serves as a lightweight, interactive browser for ESCO datasets, enabling quick exploration of occupational–skill relationships without the need for external databases or web services (**Figure 27**).

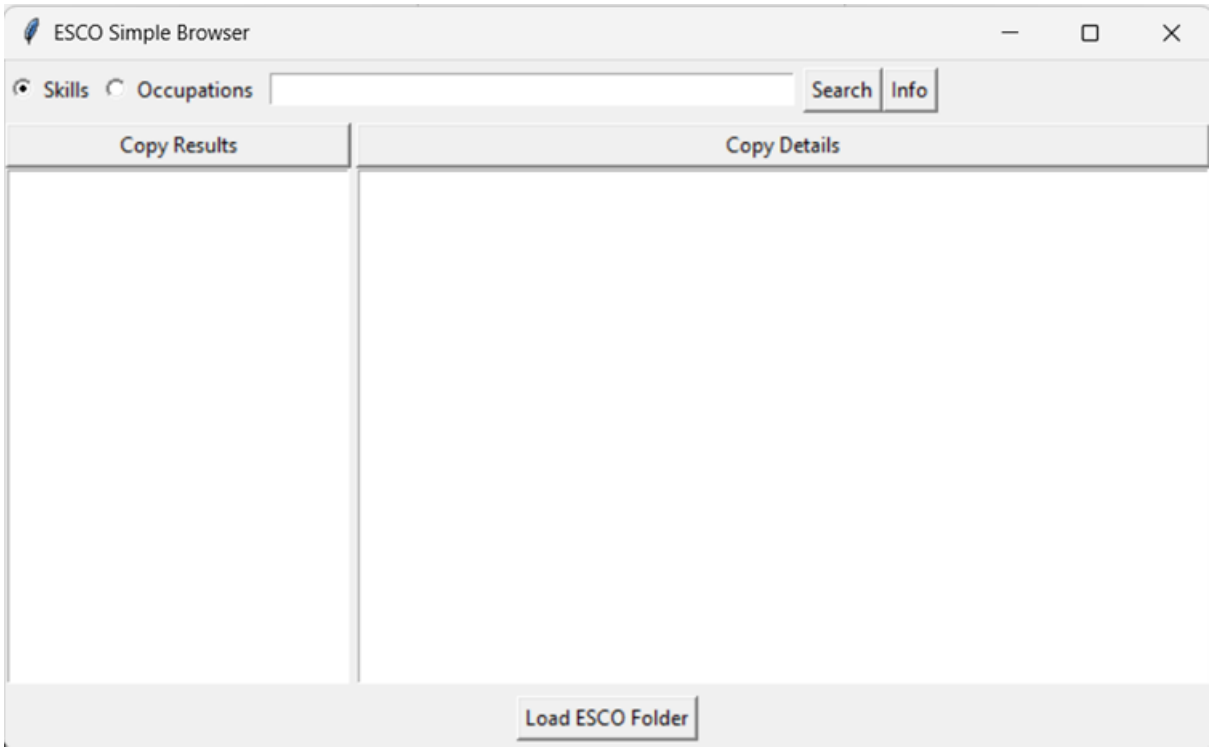

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Figure 27 Interactive browser for ESCO datasets

First, the user must provide the path to the folder containing the ESCO data. After loading the dataset, the user can choose whether the search will be performed for skills or occupations. In the upper part of the interface there is a text field where the user can enter the desired keyword. Based on this input, the application performs a search and returns all matching skills or occupations. The results are displayed in the panel on the left side of the window. By selecting any item from this list, the user receives an extended view showing all related occupations or skills, depending on the selected mode. Additional functionality allows the user to copy both the search results and the detailed relations to a text editor or clipboard. Moreover, the "Info" button provides information about the author, institution, date, and project context (**Figure 28**). ESCO original browser is presented in **Figure 29**.

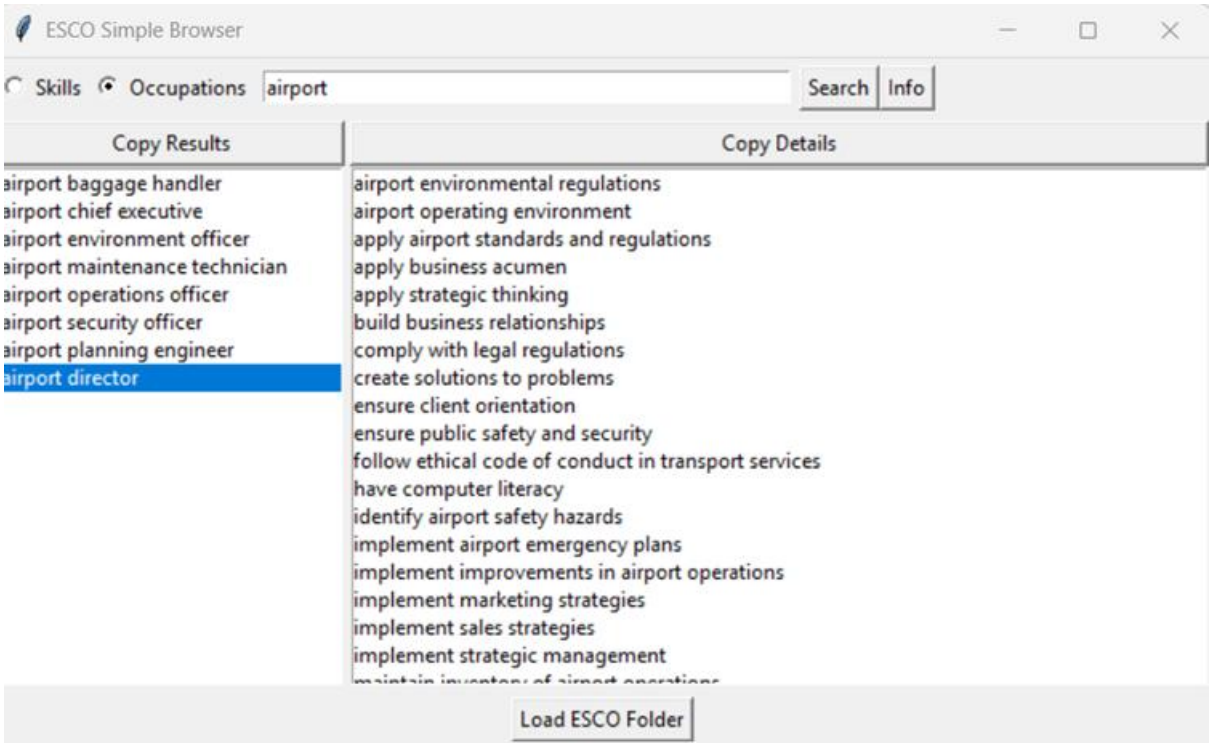

Figure 28 Example of ESCO simple browser utilization

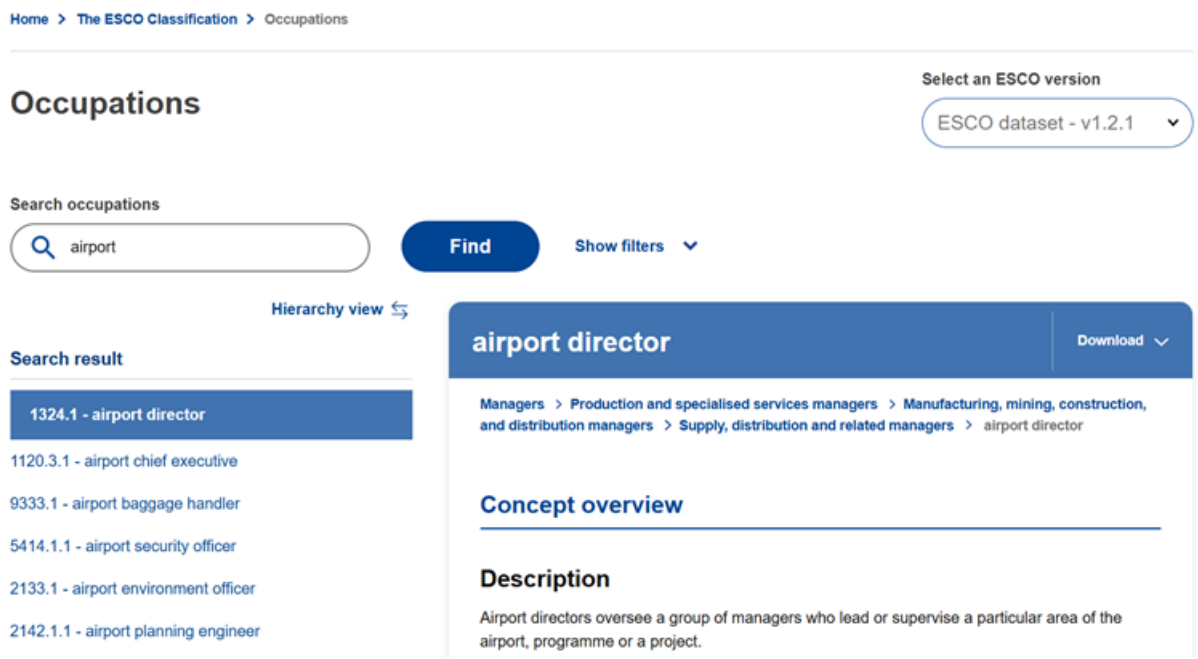

Figure 29 PrintScrin of ESCO browser

The full content of the script is provided in **Annex 9**.

4. Conclusions

Deliverable **D2.2** establishes the methodological foundation for developing the AEROFUSE Skills Intelligence system and the project's Body of Knowledge. The proposed framework enables the systematic identification, analysis and organisation of technologies, skills, competences, job roles and workforce challenges relevant to the three strategic areas addressed by the project: satellite and spacecraft manufacturing and operations, aircraft production and Maintenance, Repair and Overhaul (MRO), and airports.

The methodology reflects the complexity and rapid transformation of the European aerospace sector. COVID-19, digitalisation, artificial intelligence, automation, advanced manufacturing, cybersecurity, sustainability requirements, the green transition and geopolitical developments are changing the content of existing occupations and creating demand for new combinations of technical, digital, operational and transversal competences. For this reason, the Body of Knowledge cannot be developed on the basis of a single source or analytical method. Instead, the deliverable adopts a multi-source mixed-methods approach integrating scientific literature, industry reports, labour market

information, job advertisements, surveys, interviews, European projects, educational programmes and the ESCO classification.

An important strength of the proposed framework is the triangulation of evidence. Information obtained from individual sources will be compared, cross-checked and interpreted collectively. Scientific literature provides insight into emerging technological and competence trends, while industry reports and job advertisements offer evidence of current labour market demand. Surveys and interviews add stakeholder experience and sector-specific interpretation, and the analysis of education and training programmes provides the supply-side perspective. Together, these sources enable a more comprehensive assessment of the relationship between technological transformation, employer demand and the availability of relevant education and training.

The methodology also introduces AI-supported data mining and semantic analysis to facilitate the processing of large volumes of heterogeneous textual information. These tools support the extraction, grouping and comparison of technologies, skills, competences and job roles. However, automated outputs are not considered final findings. They require expert verification, contextual interpretation and comparison with evidence obtained from other sources. Maintaining human oversight is particularly important when distinguishing between technologies, skills, competences and occupational roles, as well as when interpreting terminology used inconsistently across documents and labour market sources.

The ESCO classification provides a common European reference framework for structuring identified occupations, skills and competences. Its use supports consistency and comparability with European labour market and education systems. At the same time, comparison with ESCO may reveal emerging competence areas and evolving professional profiles that are not yet fully represented in existing classifications. The dedicated ESCO browser developed within the project supports the exploration of relationships between occupations and skills and provides a practical tool for the further development of the Body of Knowledge.

The educational intelligence methodology complements the demand-side analysis by examining the extent to which current Higher Education and Vocational Education and Training programmes address identified sector needs. The proposed semantic mapping framework enables the analysis of learning outcomes, course content, workload, competence coverage, curriculum progression, overlaps and potential gaps. Its pilot implementation at the University of Seville provides an initial environment for

methodological validation and will support the future extension of the approach to other educational institutions participating in the project.

Preliminary results confirm the relevance of the adopted approach. The initial literature analysis suggests that technological change, particularly artificial intelligence, is primarily transforming existing aerospace and aviation occupations rather than replacing them with entirely new professions. Traditional roles increasingly require additional competences related to AI literacy, data interpretation, human–machine collaboration, digital tools and critical assessment of automated outputs. Initial labour market analysis also indicates that employers seek combinations of specialised technical knowledge and transversal competences, including teamwork, communication, problem-solving, adaptability, initiative and analytical thinking.

These observations should nevertheless be interpreted with caution. The deliverable primarily describes methodologies, while several data collection activities remain ongoing. In particular, the survey findings are based on an initial sample of eleven responses and cannot yet be treated as representative of the European aerospace sector. The collection of job advertisements, educational programmes, interviews and outputs from European projects will also continue. Consequently, the preliminary findings included in **D2.2** provide an initial evidence base that will be expanded, compared and validated in subsequent stages of the project.

The methodology developed in **D2.2** is designed to remain scalable and updateable. This is essential because technologies, labour market needs and educational programmes are continuously evolving. The framework can therefore support not only the preparation of subsequent Body of Knowledge reports but also the regular monitoring of emerging technologies, skills shortages, occupational changes and educational responses.

The results generated through the application of this methodology will contribute to the development of the Sector Skills Strategy, recommendations for curriculum adaptation, new training and upskilling pathways, and stronger cooperation between industry, Higher Education Institutions and VET providers. They will also support the future AEROFUSE Skills Observatory, which is intended to maintain and update the project's Skills Intelligence beyond the project implementation period.

To summarize, Deliverable **D2.2** provides a coherent framework for transforming dispersed and heterogeneous information into structured, comparable and actionable knowledge. By combining labour market demand, technological intelligence, stakeholder expertise and

educational supply analysis, the methodology creates a robust basis for identifying current and future workforce needs and for improving the alignment between the European aerospace sector and education and training systems.

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6. Annexes

Annex 1 – Scientific publication analysis

In the Annex 1 a targeted selection of scientific journal articles was retrieved using domain-specific keyword searches and processed via AI-based prompt analysis to extract evolving workforce requirements. This methodology identified 11 job roles, 5 core AI technology domains (machine learning, neural networks, computer vision, natural language processing, and AI system architecture), and 61 total skills and competences (comprising 42 role-specific skills and 19 cross-cutting NextTech and NextGen competencies). Overall, the findings reveal that AI is transforming established aviation occupations rather than creating entirely separate professions, emphasizing a dual need for conceptual AI literacy and strong human–AI collaboration skills.

1. The selection of journals was carefully considered based on:

General and specific considerations:

- General knowledge and skills
- Specialized knowledge and skills such - simulations, technologies, piloting materials, weather conditions

Search terms:

- Aviation AND skills
- Defense AND skills
- Airports AND skills

High-demand requirements, e.g.:

- European Critical Raw materials
- Airports with high traffic density and challenging wind conditions

2. Prompt:

Analyse this scientific publication to extract the new Job professions. For these job professions assign key skill and competences expected from potential applicants. Include only skills and competences which were mentioned in the publication.

3. The following articles were used to prepare the preliminary results:

Article tittle	Keywords	Publisher / Database	Journal
Artificial Intelligence in Aviation: New Professionals for New Technologies	Aviation AND skills	MDPI	Applied sciences
Educational Initiative Using Simulation Training for the Evolving Landscape of Hybrid Warfare and Its Devastating Impacts: A Scoping Review	Defense AND skills	SCOPUS	Scandinavian Journal of Military Studies
Challenges and opportunities of the European Critical Raw Materials	Defense AND skills	SCOPUS	Mineral Economics
Hong Kong Airport Wind Shear Now-Casting System Development and Evaluation	Airports AND skills	MDPI	Atmosphere
Classics: consigned to the past, or the key to the future? In defence of a classical curriculum	Defense AND skills	SCOPUS	Cambridge University Press

4. Answer

Based on the attached publications, AI tools provided information on skills, knowledge and new Job professions as well as follows:

AI-enabled / Emerging Professional Profile	Key skills and competencies (mentioned in the publication)
AI-Enabled Pilot	• Understanding AI and machine learning principles • Using AI for flight planning, optimization, and real-time decision-making • Interpreting AI system outputs • Understanding AI limitations • Responding appropriately when AI systems fail or provide unexpected outputs • Human-AI decision making
AI-Enabled Aerospace Engineer	• Understanding AI-assisted design, simulation, and predictive maintenance • Using AI tools for optimization and modelling • Working collaboratively with AI systems • Providing correct input parameters to AI tools • Interpreting AI-generated results • Troubleshooting AI systems

AI-enabled / Emerging Professional Profile	Key skills and competencies (mentioned in the publication)
AI-Enabled Aviation Manager	• Understanding AI applications in scheduling, routing and customer service • Knowledge of AI-supported decision-making • Integrating AI decision-support with human oversight • Managing data-driven teams • Making final decisions when AI recommendations conflict with traditional approaches
AI-Enabled Air Traffic Controller	• Understanding AI-based traffic prediction • Using AI-enhanced communication tools • Decision making when AI predictions conflict with human judgement • Operating AI tools under stressful conditions • Troubleshooting AI-supported systems
AI-Enabled Aircraft Maintenance Technician / Engineer	• Understanding predictive maintenance, AI-based fault detection and quality assurance • Using AI diagnostic tools • Interpreting AI diagnostic results • Knowing when to rely on AI versus manual inspection • Maintaining and updating AI-enabled maintenance tools
AI Aviation Technologist	• Understanding AI-enhanced navigation systems, cockpit automation and fuel efficiency technologies • Proficiency in current AI technologies • Implementing AI tools • Managing AI systems • Interpreting AI-generated operational data • Troubleshooting AI technologies
AI Aviation Safety Specialist	• Understanding AI applications for accident analysis and safety prediction • Using AI for risk assessment • Interpreting AI-generated safety information • Knowing when human judgement should override AI • Managing AI safety tools effectively
AI Aeronautics / Aviation Science Professional	• Understanding AI applications in aerodynamics and fuel optimization • Using AI for research and development • Interpreting AI-generated research results • Integrating AI methods with traditional aeronautical practices

Cross-cutting competencies expected from all future AI-enabled aviation professionals

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The publication identifies a common competency framework that applies across all aviation professions:

AI knowledge (NextTech):

- Machine learning
- Neural networks
- Computer vision
- Natural language processing
- AI system architecture
- AI capabilities and limitations
- Data requirements and infrastructure
- AI ethics
- AI applications in aviation domains

Human–AI collaboration competencies (NextGen):

- Interpreting and critically evaluating AI outputs
- Knowing when to rely on AI versus human expertise
- Communicating and collaborating with AI systems
- Ethical and responsible AI use
- Identifying AI limitations and challenges
- Adapting workflows to AI-supported processes
- Monitoring AI performance and improvements
- Identifying opportunities for AI augmentation
- Explaining AI decisions and behaviour
- Monitoring AI for accuracy, bias and unintended consequences

Important observation

The paper's central conclusion is that AI is transforming existing aviation professions rather than creating completely new occupations. The "new professionals" referred to in the title are traditional aviation professionals equipped with new AI competencies, capable of working effectively in AI-augmented aviation environments. The authors argue that aviation education should therefore focus on developing both:

1. Conceptual AI literacy (NextTech), and
2. Human–AI collaboration skills (NextGen)

to prepare graduates for the future aviation workforce.

Annex 2 – List of industrial reports

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Annex 3 – List of companies whose representatives were invited to complete the survey

No.	Name of the organisation	Industry
1	MachAero	Aerospace
2	Aerotec	Aerospace
3	Figeac Aero	Aerospace
4	JCB aero	Aerospace
5	UUDS aero	Aerospace
6	Sudaero	Aerospace
7	Mazeres Aero	Aerospace
8	Fregate	Aerospace
9	Potez	Aerospace
10	Aeronefs	Aerospace/defence
11	Corse Composite Aeronautique	Aerospace
12	Roxel propulsion systems	Aerospace/defence
13	AIRBUS	Aerospace
14	CGI	Aerospace
15	ESSP	Space
16	GMV	Aerospace
17	Hexagon	Aerospace
18	Hitachi Rail	Aerospace
19	INDRA	Aerospace
20	Kongsberg	Aerospace
21	INECO	Aerospace
22	NLR	Aerospace
23	OHB	Aerospace
24	SES	Space
25	Septentrio	Aerospace
26	SOGEI	Aerospace
27	Spirent	Airport
28	StARR	Aerospace
29	Thales	Aerospace
30	Bold Robotics	Space
31	Cityoo	Space
32	ENARTIN	Space
33	Eptune Engineering	Space

34	GasExpress	Space
35	Localista	Space
36	LS Engenharia	Space
37	Our Watch Leads (OWL)	Space
38	SpacEngineer	Space
39	SPACEWAY	Space
40	STARUPLO	Space
41	ViBo Health	Space
42	WaterdogMobile	Space
43	Active Aerogels	Space
44	Airborne Projects	Space
45	Bluecover Technologies	Space
46	Connect Robotics	Space
47	D-Orbit Portugal	Space
48	Delox	Space
49	Eye2Map	Space
50	Findster	Space
51	Horizontal Cities	Space
52	InanoE	Space
53	iTrack Solutions	Space
54	Kinetikos	Space
55	Matereo Space	Space
56	mOceanSense	Space
57	ParqIST	Space
58	PavNext	Space
59	SpaceLayer Technologies	Space
60	Stratio Automotive	Space
61	Tesselo	Space
62	The Loop co.	Space
63	THEIA	Space
64	Spotlite	Space
65	Klog Logistics	Airports
66	AMG Aero	Aeronautical
67	Ilex Space	Space

Annex 4 – Questionnaire

The complete structure of the survey questionnaire used to collect respondents' feedback is presented below. This survey enabled the gathering of valuable insights regarding the impact of external drivers, emerging technologies, skills requirements, evolving job roles, workforce needs, and educational course formats.

Questionnaire:

This survey is part of the AEROFUSE project and aims to gather structured information on how recent external drivers – including COVID-19, digital and deep-tech transformation, the green transition, and geopolitical challenges – are affecting technologies, skills and job roles in the aerospace and defence sectors.
The survey focuses on technologies used in organisations, required skills and competences, evolving job roles, workforce challenges, and training needs.
Your responses will help better understand how technological developments are shaping skills demand and where the most important competence gaps exist.
The questionnaire should take approximately 40 minutes to complete. This questionnaire does not collect personal data. All responses will be analysed in aggregated form.
This section collects basic information about the respondent and the organization in order to better interpret the survey results.

SECTION 1 – Respondent and organisational profile

Type of organisation

- Company
- Public sector / authority
- Education / training provider
- Other (please specify)

If other, which one?

Organisation's role in the supply chain *(Select all that apply)*

- Original Equipment Manufacturer (OEM)
- Tier 1 supplier (direct supplier to OEM)
- Tier 2 / Tier 3 supplier (subcontractor)
- Maintenance, Repair and Overhaul (MRO) provider
- System integrator
- Component / parts manufacturer
- Raw materials supplier

- Technology / software provider
- Research and development (R&D)
- Education and skills development for industry
- Testing, certification or quality assurance body
- Airports / airport operations
- Logistics / distribution provider
- Other (please specify)

If other, which one?

Size of organisation

- Micro / Small (1-49 employees)
- Medium (50-249 employees)
- Large (250+ employees)
- Public authority / not applicable

Sector

- Aviation
- Space
- Defence-related aerospace
- Other (please specify)

If other, which one?

Role of respondent in organisation

- Technical / operational role
- Management / leadership role
- Policy / strategy role
- Training / HR / skills development role

Please select the country of your organisation

SECTION 2 – External drivers of technological and workforce change

In this section, we aim to understand how broader economic, technological and geopolitical drivers influence the adoption of new technologies and the demand for skills and job roles within your organisation.

To what extent have **the COVID-19** and the **post-pandemic recovery** affected skills needs in your organisation?

- No impact
- Low impact
- Moderate impact

- High impact

If relevant, please provide 2–3 specific examples of:

Technologies introduced or accelerated due to **COVID-19** and the **post-pandemic recovery**:

Skills or **competences** that became more important due to **COVID-19** and the **post-pandemic recovery**:

New or significantly changing **job roles** due to **COVID-19** and the **post-pandemic recovery**:

To what extent has **the digital transformation** affected skills needs in your organisation?

- No impact
- Low impact
- Moderate impact
- High impact

If relevant, please provide 2–3 specific examples of:

Technologies introduced or accelerated due to **digital transformation**:

Skills or **competences** that became more important due to **digital transformation**:

New or significantly changing **job roles** due to **digital transformation**:

To what extent have the deep-tech developments affected skills needs in your organisation?

Deep-tech developments are often considered game-changing or transformative technologies, as they can significantly reshape industrial processes, markets and skills requirements, e.g. hydrogen technologies.

- No impact
- Low impact
- Moderate impact
- High impact

If relevant, please provide 2–3 specific examples of:

Technologies introduced or accelerated due to **deep-tech developments**:

Skills or **competences** that became more important due to **deep-tech developments**:

New or significantly changing **job roles** due to **deep-tech developments**:

To what extent has **the green transition** affected skills needs in your organisation?

- No impact
- Low impact
- Moderate impact
- High impact

If relevant, please provide 2–3 specific examples of:

Technologies introduced or accelerated due to **green transition**:

Skills or **competences** that became more important due to **green transition**:
New or significantly changing **job roles** due to **green transition**:
To what extent have the **geopolitical developments** affected skills needs in your organisation? *Geopolitical developments refer to changes in international relations between countries or regions of the world that influence political, economic, security, and technological developments. They include, among others, international conflicts, shifts in political power balances, security and defence policies, economic sanctions, international cooperation, and the formation of new alliances.*

- No impact
- Low impact
- Moderate impact
- High impact

If relevant, please provide 2–3 specific examples of:
Technologies introduced or accelerated due to **geopolitical developments**:
Skills or **competences** that became more important due to **geopolitical developments**:
New or significantly changing **job roles** due to **geopolitical developments**:
How has your organisation prepared for **future major external disruptions** (e.g. pandemics, geopolitical crises, climate-related events)? Please describe any **technologies**, **skills** or **job roles** that have been introduced or adapted.

SECTION 3 – Technologies used or planned in the organisation
This section aims to identify which technologies are currently used in your organisation and which are expected to be adopted in the coming years.

Which of the following **Digital & Data Technologies** are currently used or planned to be implemented in your organisation?

Technology	Currently implemented	Planned within the next 5 years	Potentially useful, but currently not planned for implementation	Not relevant
Artificial Intelligence and Machine	○	○	○	○

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Technology	Currently implemented	Planned within the next 5 years	Potentially useful, but currently not planned for implementation	Not relevant
Learning technologies				
Data analytics and advanced data processing	○	○	○	○
Cloud, distributed and high-performance computing technologies	○	○	○	○
Internet of Things and sensor networks	○	○	○	○
Advanced software and digital platform technologies	○	○	○	○
Edge computing technologies *(IT architecture model in which data is processed close to its source)*	○	○	○	○

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Technology	Currently implemented	Planned within the next 5 years	Potentially useful, but currently not planned for implementation	Not relevant
Immersive technologies (VR / XR)	○	○	○	○

Which of the following **Cyber, Communications & Digital Infrastructure Technologies** are currently used or planned to be implemented in your organisation?

Technology	Currently implemented	Planned within the next 5 years	Potentially useful, but currently not planned for implementation	Not relevant
Cybersecurity and cyber-resilience technologies	○	○	○	○
Secure communication and encryption technologies	○	○	○	○
Quantum-secure communication technologies	○	○	○	○
Network and advanced connectivity technologies	○	○	○	○

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Technology	Currently implemented	Planned within the next 5 years	Potentially useful, but currently not planned for implementation	Not relevant
Satellite communication technologies	○	○	○	○
Digital identity and biometric technologies	○	○	○	○
Mobility and location analytics technologies	○	○	○	○

Which of the following **Autonomous, Robotic & System Technologies** are currently used or planned to be implemented in your organisation?

Technology	Currently implemented	Planned within the next 5 years	Potentially useful, but currently not planned for implementation	Not relevant
Autonomous and unmanned systems	○	○	○	○
Robotics and robotic automation technologies	○	○	○	○
Human–machine interaction technologies	○	○	○	○

Technology	Currently implemented	Planned within the next 5 years	Potentially useful, but currently not planned for implementation	Not relevant
System integration and system-of-systems engineering	○	○	○	○
Advanced sensing and sensor fusion technologies	○	○	○	○
Connected and intelligent transport technologies	○	○	○	○

Which of the following **Space & Aviation Technologies** are currently used or planned to be implemented in your organisation?

Technology	Currently implemented	Planned within the next 5 years	Potentially useful, but currently not planned for implementation	Not relevant
Satellite systems and on-board satellite software	○	○	○	○
Satellite data processing and Earth observation technologies	○	○	○	○
Satellite navigation and	○	○	○	○

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Technology	Currently implemented	Planned within the next 5 years	Potentially useful, but currently not planned for implementation	Not relevant
advanced positioning technologies				
Space situational awareness technologies	○	○	○	○
Aerospace autonomous systems and eVTOL technologies	○	○	○	○

Which of the following **Advanced Industrial & Materials Technologies** are currently used or planned to be implemented in your organisation?

Technology	Currently implemented	Planned within the next 5 years	Potentially useful, but currently not planned for implementation	Not relevant
Advanced and novel materials technologies	○	○	○	○
Additive manufacturing technologies (3D printing)	○	○	○	○
Industrial automation technologies	○	○	○	○

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Technology	Currently implemented	Planned within the next 5 years	Potentially useful, but currently not planned for implementation	Not relevant
Digital engineering, modelling and simulation technologies	○	○	○	○
Smart energy management technologies	○	○	○	○
Photonics and optoelectronic technologies	○	○	○	○
Semiconductor design and manufacturing technologies	○	○	○	○

Which of the following **Deep-tech & Disruptive Technologies** are currently used or planned to be implemented in your organisation?

Technology	Currently implemented	Planned within the next 5 years	Potentially useful, but currently not planned for implementation	Not relevant
Energy storage and energy resilience technologies	○	○	○	○
Hydrogen and sustainable	○	○	○	○

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Technology	Currently implemented	Planned within the next 5 years	Potentially useful, but currently not planned for implementation	Not relevant
aviation fuel (SAF) technologies				
Quantum technologies (computing, sensing)	○	○	○	○
Biotechnology / bioengineering	○	○	○	○
Hypersonic technologies	○	○	○	○
Advanced propulsion technologies	○	○	○	○

SECTION 4 – Skills and competences

This section aims to identify the key skills and competences that are currently important in your organisation, difficult to recruit, or expected to become more important in the coming years.

Skill means the ability to apply knowledge and use know-how to complete tasks and solve problems. Competence means the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development.

"Difficult to recruit" refers to skills or competences for which an organisation faces persistent difficulties in finding suitably qualified candidates.

Which of the following **Digital & Data Skills** are currently available or planned to be developed in your organisation?

Skills	Important today	Difficult to recruit	More important in the next 5 years	Not relevant / Not applicable
Artificial Intelligence development and applications	☐	☐	☐	☐
Data science, big data processing and data engineering	☐	☐	☐	☐
Software development and advanced software engineering	☐	☐	☐	☐
Data visualisation and decision-support analytics	☐	☐	☐	☐
Cloud, distributed and high-performance computing management	☐	☐	☐	☐
IoT system development and management	☐	☐	☐	☐
Digital customer experience management	☐	☐	☐	☐

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Skills	Important today	Difficult to recruit	More important in the next 5 years	Not relevant / Not applicable
Data and AI-driven service personalisation	☐	☐	☐	☐
Spatial and mobility data analytics	☐	☐	☐	☐
Data integrity and data governance management	☐	☐	☐	☐
Supply chain risk analysis	☐	☐	☐	☐
Maintenance data and digital records management	☐	☐	☐	☐

Which of the following **Cybersecurity, Communication & Digital Infrastructure Skills** are currently available or planned to be developed in your organisation?

Skills	Important today	Difficult to recruit	More important in the next 5 years	Not relevant / Not applicable
Cybersecurity, cyber defence and cyber-resilience management	☐	☐	☐	☐
Network security and infrastructure management	☐	☐	☐	☐

Skills	Important today	Difficult to recruit	More important in the next 5 years	Not relevant / Not applicable
Secure communication and cryptography technologies	☐	☐	☐	☐
Quantum-secure communication technologies	☐	☐	☐	☐
Satellite communication systems management	☐	☐	☐	☐
Digital infrastructure management skills	☐	☐	☐	☐
Threat detection and risk analytics skills	☐	☐	☐	☐

Which of the following **Autonomous, Robotic & Systems Engineering Skills** are currently available or planned to be developed in your organisation?

Skills	Important today	Difficult to recruit	More important in the next 5 years	Not relevant / Not applicable
Autonomous and unmanned systems engineering	☐	☐	☐	☐
Sensing and sensor fusion systems	☐	☐	☐	☐

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Skills	Important today	Difficult to recruit	More important in the next 5 years	Not relevant / Not applicable
(engineering – system design & integration)				
Sensing and sensor fusion systems (development – algorithms & software)	☐	☐	☐	☐
Control systems engineering	☐	☐	☐	☐
Human-machine interaction design	☐	☐	☐	☐
Systems engineering and system integration	☐	☐	☐	☐
Robotics engineering	☐	☐	☐	☐
Surveillance and monitoring systems development	☐	☐	☐	☐

Which of the following **Space & Aviation Engineering Skills** are currently available or planned to be developed in your organisation?

Skills	Important today	Difficult to recruit	More important in the next 5 years	Not relevant / Not applicable
Satellite systems engineering	☐	☐	☐	☐
Satellite and Earth observation data analysis	☐	☐	☐	☐
Navigation and positioning systems engineering (GNSS)	☐	☐	☐	☐
Space situational awareness analysis	☐	☐	☐	☐
On-board software development for aerospace systems	☐	☐	☐	☐
Aerospace systems engineering	☐	☐	☐	☐

Which of the following **Advanced Industrial & Materials Engineering Skills** are currently available or planned to be developed in your organisation?

Skills	Important today	Difficult to recruit	More important in the next 5 years	Not relevant / Not applicable
Materials science and advanced materials engineering	☐	☐	☐	☐

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Skills	Important today	Difficult to recruit	More important in the next 5 years	Not relevant / Not applicable
Additive manufacturing engineering	☐	☐	☐	☐
Advanced manufacturing technologies	☐	☐	☐	☐
Digital engineering, modelling and simulation	☐	☐	☐	☐
Digital twin development	☐	☐	☐	☐
Semiconductor engineering and chip design	☐	☐	☐	☐

Which of the following **Deep-Tech & Emerging Technology Skills** are currently available or planned to be developed in your organisation?

Skills	Important today	Difficult to recruit	More important in the next 5 years	Not relevant / Not applicable
Quantum technology development	☐	☐	☐	☐
Biotechnology and bioengineering	☐	☐	☐	☐
Hypersonic systems engineering	☐	☐	☐	☐

Skills	Important today	Difficult to recruit	More important in the next 5 years	Not relevant / Not applicable
Advanced propulsion systems engineering	☐	☐	☐	☐
Energy storage and resilient energy systems engineering	☐	☐	☐	☐
Sustainable aviation fuels and low-carbon transition technologies	☐	☐	☐	☐

Which of the following **operational** or **sector-specific** skills are currently available or planned to be developed in your organisation?

Skills	Important today	Difficult to recruit	More important in the next 5 years	Not relevant / Not applicable
Operational process automation management	☐	☐	☐	☐
Infrastructure and systems operations management	☐	☐	☐	☐
Supply chain and logistics operations management	☐	☐	☐	☐
Maintenance and asset management	☐	☐	☐	☐

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Skills	Important today	Difficult to recruit	More important in the next 5 years	Not relevant / Not applicable
Safety and risk management	☐	☐	☐	☐
Regulatory compliance and certification processes	☐	☐	☐	☐

Which of the following **cross-cutting** and **professional** skills are currently available or planned to be developed in your organisation?

Skills	Important today	Difficult to recruit	More important in the next 5 years	Not relevant / Not applicable
Analytical and critical thinking	☐	☐	☐	☐
Complex and creative problem solving	☐	☐	☐	☐
Systems thinking	☐	☐	☐	☐
Interdisciplinary collaboration	☐	☐	☐	☐
Project and programme management	☐	☐	☐	☐
Adaptability and continuous learning	☐	☐	☐	☐
Communication and stakeholder engagement	☐	☐	☐	☐

Skills	Important today	Difficult to recruit	More important in the next 5 years	Not relevant / Not applicable
Innovation mindset	☐	☐	☐	☐

Are there any other skills not listed above that are important in your organisation **today**? Please list them below.
Are there any other skills not listed above that are particularly **difficult to recruit** for in your organisation? Please list them below.
Are there any other skills not listed above that you expect will become more important in your organisation in the **next 5 years**? Please list them below.

SECTION 5 – Job roles

This section aims to identify how key job roles in your organisation are evolving in terms of demand, upskilling needs and the emergence of new roles.

- *Increasing demand – This role already exists in the organisation, but the demand for it is growing (e.g. more staff may be needed).*
- *Requires upskilling – The role exists in the organisation, but employees in this role need to develop new skills to respond to technological or organisational changes.*
- *New role emerging – This role is newly appearing in the organisation as a result of new technologies, processes or business needs.*

How are the following job roles related to **Digital & Data Technologies** evolving in your organisation?

Job roles	Increasing demand	Requires upskilling	New role emerging	Not relevant / Not applicable
***AI / Machine Learning Engineer / Specialist				

Job roles	Increasing demand	Requires upskilling	New role emerging	Not relevant / Not applicable
Data Analyst	☐	☐	☐	☐
Data Engineer	☐	☐	☐	☐
Data Scientist	☐	☐	☐	☐
Cloud Engineer	☐	☐	☐	☐
Software Developer / Software Engineer	☐	☐	☐	☐
Digital service and customer experience specialists	☐	☐	☐	☐
Spatial / geospatial data specialists	☐	☐	☐	☐
Computer vision / video analytics specialists	☐	☐	☐	☐
Mobility analytics specialists	☐	☐	☐	☐
Supply chain risk analysts	☐	☐	☐	☐

How are the following job roles related to **Cyber, Communication & Digital Infrastructure** evolving in your organisation?

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Job roles	Increasing demand	Requires upskilling	New role emerging	Not relevant / Not applicable
Cybersecurity / Information Security Specialist	☐	☐	☐	☐
Cyber Defence Specialist	☐	☐	☐	☐
Network Engineer	☐	☐	☐	☐
Cryptography Specialist	☐	☐	☐	☐
Threat detection and monitoring systems specialists	☐	☐	☐	☐
Digital Infrastructure Systems Engineer	☐	☐	☐	☐

How are the following job roles related to **Autonomous, Robotic & Systems Technologies** evolving in your organisation?

Job roles	Increasing demand	Requires upskilling	New role emerging	Not relevant / Not applicable
Robotics Engineer	☐	☐	☐	☐
Autonomous and Unmanned Systems Engineer	☐	☐	☐	☐

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Job roles	Increasing demand	Requires upskilling	New role emerging	Not relevant / Not applicable
Control Systems Engineer	☐	☐	☐	☐
Systems and Systems Integration Engineer	☐	☐	☐	☐
Systems Architect	☐	☐	☐	☐
Automation Engineer	☐	☐	☐	☐

How are the following job roles related to **Space & Aviation Technologies** evolving in your organisation?

Job roles	Increasing demand	Requires upskilling	New role emerging	Not relevant / Not applicable
Aerospace Engineer	☐	☐	☐	☐
Space and Satellite Systems Engineer	☐	☐	☐	☐
Satellite Data Analyst	☐	☐	☐	☐
GNSS / Navigation Systems Engineer	☐	☐	☐	☐
Aerospace Software Engineer	☐	☐	☐	☐

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Job roles	Increasing demand	Requires upskilling	New role emerging	Not relevant / Not applicable
Operations Systems Engineer	☐	☐	☐	☐

How are the following job roles related to **Advanced Industrial & Materials Technologies** evolving in your organisation?

Job roles	Increasing demand	Requires upskilling	New role emerging	Not relevant / Not applicable
Materials Engineer	☐	☐	☐	☐
Manufacturing Engineer	☐	☐	☐	☐
Additive Manufacturing Engineer	☐	☐	☐	☐
Industrial Engineer	☐	☐	☐	☐
Digital Engineering and Simulation Specialist	☐	☐	☐	☐
Semiconductor Engineer	☐	☐	☐	☐

How are the following job roles related to **Deep-Tech & Emerging Technologies** evolving in your organisation?

Job roles	Increasing demand	Requires upskilling	New role emerging	Not relevant / Not applicable
Quantum Engineer / Quantum Scientist	☐	☐	☐	☐
Bioengineer / Biotechnology Specialist	☐	☐	☐	☐
Propulsion Engineer	☐	☐	☐	☐
Hypersonic Systems Engineer	☐	☐	☐	☐
Energy Systems Engineer	☐	☐	☐	☐
Sustainability and environmental systems specialist	☐	☐	☐	☐

SECTION 6 – Workforce needs

This section aims to identify key workforce challenges in your organisation, including the categories of workers that are most difficult to recruit and the competences that are most important for your organisation.

Which categories of workers are currently most difficult to recruit in your organisation? *(Select up to three)*

- Production workers
- Skilled trades workers (e.g. mechanics, electricians, welders, maintenance mechanics)
- Technicians and technical specialists (e.g. avionics, electronics, laboratory or testing technicians)
- Digital and IT specialists
- Engineers

- Research and development specialists
- Other (please specify)

If other, which one?

Which types of competences, in responding to technological developments, are most important for your organisation? *(Select up to three)*

- Technical and engineering competences
- Digital, data and AI competences
- Advanced manufacturing and industrial competences
- Systems integration competences
- Sustainability and environmental competences
- Supply chain and logistics competences (including supply chain resilience)
- Analytical and problem-solving competences
- Collaboration and teamwork competences
- Interdisciplinary competences (combining engineering, digital and operational skills)
- Other (please specify)

If other, which one?

SECTION 7 – Training and skills development

This section aims to understand training needs in your organisation, including preferred training formats and areas where appropriate training programmes are difficult to find.

Which types of training formats would be most useful for reskilling or upskilling employees in your organisation? *(Select all you need)*

- Micro-training sessions (up to 8 hours)
- Short training courses (1–2 days)
- Intensive training courses (up to 1 week)
- Modular training programmes (several short modules over time)
- Online training / e-learning courses
- Professional certification programmes
- Postgraduate studies (2 semesters)
- Postgraduate studies (3 semesters or more)
- Industry–academia training programmes
- Other (please specify)

If other, which one?

In which skills or technology areas is it **most difficult** for your organisation to find appropriate training programmes? *Please briefly describe.*
Additional comments

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Annex 5 – List of job postings sources

List of job offers that were used to build the job offer database. Table lists the companies whose job postings were analysed. A link to the company website containing the job postings is also provided as well as the file name containing the job offer details.

Name of the service or company	**Type of the service[1]**	**Main language**	**Website address**	**File name**
Leonardo	Aerospace industry	Italian / English	[W1]	[F1], [F10]
Telespazio	Aerospace industry	Italian	[W1], [W17]	[F1], [F8]
Leonardo Divisione Velivoli	Aerospace industry	Italian	[W1]	[F1]
Leonardo Global Solutions	Aerospace industry	Italian	[W1]	[F1]
EME Aero	Aerospace industry	Polish	[W2]	[F2]
Heli-One	Aerospace industry	English	[W3]	[F2]
Pratt & Whitney Poland	Aerospace industry	English / Polish	[W4]	[F3]
KALE PRATT & WHITNEY Turkiye	National	Turkish	[W5]	[F3]
ORBITER AVIATION Turkiye	National	Turkish	[W5]	[F3]
Pegasus Airlines Turkiye	National	Turkish	[W5]	[F3]
Southwind Airlines Turkiye	National	Turkish	[W5]	[F3]
YDA Airports Turkiye	National	Turkish	[W5]	[F3]
Segula technologies	Aerospace	French	[W6]	[F4]
Arial industries	Aerospace	French	[W6]	[F4]

[1] Aerospace industry: job offers placed on the Aerospace industry company website (producer of aircraft, engines, equipment, avionics, etc.); National: Job offers placed on the general job offers service of national scope website (state, country)

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Safran Electronics & Defense	Defense aerospace	French / English	[W7]	[F4]
HYPERION AVIATION	Service activities incidental to air transportation	English	[W8]	[F5]
Adecco Personnel Services GmbH Aviation	Aerospace	English	[W8]	[F5]
Innoflair				[F5]
Embention	Avionics	English	[W9]	[F5]
Boeing	Aircraft	English	[W9]	[F5]
IDE - Intracom Defense	Aeronautic	English	[W9]	[F5]
EUSPA - European Union Agency for the Space Programme	Space	English	[W9]	[F5]
Beyond Gravity	Aerospace	English	[W9], [W17]	[F5], [F16]
Akkodis	Aviation and aerospace	English	[W9]	[F5]
SWISSto12	Satellite			[F5]
Safran	Aeronautic	English	[W10]	[F5]
Airbus	Aerostructure	English	[W10], [W15]	[F5], [F7]
Segala	Aircraft	English	[W10]	[F5]
AIRBUS AEROSTRUCTURES S.R.L.	Aerostructure	English	[W10]	[F5]
Terma Group	Space	English	[W11]	[F5]
EnduroSat	Space	English	[W11]	[F5]
ESA	Space	English	[W11]	[F5]
Antwerp Space	Space	English	[W11]	[F5]
ESSP	Aerospace, Satellites	English	[W12]	[F6]
OHB	Satellite manufacturing	English	[W13]	[F6]
SES	Satellite manufacturing	English	[W14]	[F6]
Airbus Helicopters SAS	Aerospace	English	[W15]	[F7]
Airbus Defence and Space SAS	Aerospace	English / French	[W15]	[F7]

Airbus Atlantic	Aerospace	English / French	[W15]	[F7]
Thales Alenia Space	Aerospace	English / French	[W16], [W17]	[F7], [F8], [F10]
The Exploration Company	Space	English	[W17]	[F8]
ATG Europe	Aerospace / Space	English	[W17]	[F8]
Airbus Italia S.p.A.	Aerospace / SatCom	English	[W17]	[F8]
Avio Aero / GE Aerospace	Aerospace / Aviation	English	[W17]	[F8]
Nayak Group	Aerospace / MRO	English	[W17]	[F8]
Quick Turn Engine Center Europe	Aerospace / MRO	English	[W17]	[F8]
Serco Space Services	Space / Aerospace / Satellite Operations	English	[W17]	[F8]
TMC	Aerospace / Aeronautical engineering	English	[W17]	[F8]
Space Industries	Space / Satellite Manufacturing	English	[W17]	[F8]
Sitael S.p.A.	Satellite manufacturing	English	[W17]	[F8]
SkyAlps	Aviation/airports	English	[W17]	[F8]
Avio Aero	Aviation/MRO	English	[W17]	[F8]
UMBRAGROUP S.p.A.	Aviation/MRO	English	[W17]	[F8]
Lufthansa Technik Italia	Aviation/MRO	English	[W17]	[F8]
ITA Airways	Aviation/MRO	English	[W17]	[F8]
FL Technics Wheels & Brakes Srl.	Aviation/MRO	English	[W17]	[F8]
GEOSAT	Aerospace	English	[W17]	[F9]
TXT Group	Aeronautical	English	[W18]	[F10]
MBDA Italia	Aeronautical	English	[W18]	[F10]
Adentis Italia	Aerospace	English	[W17]	[F10]

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Linate Airport (SEA)	Aeronautical	Italian	[W19]	[F10]
Aernnova	Aerospace	English / Spanish	[W20]	[F11]
Sener	Aerospace and Defence	English / Spanish	[W21]	[F11]
CIDETEC	Aerospace (Space – battery systems for satellites and launchers)	English / Spanish	[W17], [W22]	[F11]
ITP Aero	Aeronautics (aircraft engines – turbines, Rolls-Royce project)	English / Spanish	[W23]	[F11]
Satlantis	Space Industry (Aerospace & Defense)	English / Spanish	[W24]	[F11]
Batz	engineering sector	Spanish	[W25]	[F11]
TRIGO	Aerospace and defense	German / English	[W26]	[F11]
Potez Aeronautique	Aerospace / Aeronautics manufacturing industry (aerostructures production site)	French	[W27]	[F11]
Brussels Airlines	Aerospace / Aviation Maintenance	English	[W28]	[F12]
Sabena Engineering	Aerospace / Aircraft Maintenance (civil & military)	French / English	[W29]	[F12]
EUROCONTROL – Maastricht Upper Area Control Centre (MUAC)	Aerospace / Air Traffic Management / Safety Engineering	French / English	[W30]	[F12]
Skeyes	Aerospace / Air Traffic Management	English	[W31]	[F12]
FedEx	Aerospace / Aircraft Maintenance	French / English	[W32]	[F12]
Challenge Airlines BE	Aerospace / Aircraft Engineering	French / English	[W32]	[F12]
ASL Airlines / ASL Maintenance	Aerospace / Aircraft Maintenance	French / English	[W32]	[F12]

SONACA	Aerospace / Space Systems / Defense	French / English	[W33]	[F12]
ASCO Belgium	Aerospace manufacturing / industrial engineering	French / English	[W34]	[F12]
Air Belgium (CMA CGM Group)	Aviation / Flight Operations	French / English	[W35]	[F12]
John Cockerill Defense	Defense engineering / mechanical systems integration	French / English	[W36]	[F12]
Axon SkyHero	Tactical drone systems / UAV / Robotics	English	[W37]	[F12]
ALTEN (consultancy)	Defense	English	[W38]	[F12]
ReOrbit	Space	English	[W39]	[F13], [F14]
ICEYE	Space	English	[W40]	[F13] , [F14]
Patria	Aerospace / Defense	Finnish/English	[W41]	[F14]
Lockheed Martin	Aerospace / Defense	English	[W42]	[F14]
Aalto University	Space / Academia	English	[W43]	[F14]
GA Telesis Engine Services (GATES)	Aviation / MRO	English	[W44]	[F14]
Finnair	Aviation	English	[W45]	[F14]
LimeFlight	Aviation / SaaS	English	[W46]	[F14]
Nordic Regional Airlines (NORRA)	Aviation		[W47]	[F14]
Airpro	Aviation / Ground Handling / Operations Control	Finnish	[W48]	[F14]
Finavia	Aviation / Airport Operations / Infrastructure	Finnish	[W48]	[F14]
Fastems	Aerospace / Manufacturing Automation	English	[W49]	[F14]
Joen Service Oy	Aviation / Aircraft Maintenance (MRO)	Finnish	[W50]	[F14]
Kelluu	Aerospace / Aviation / Deep-tech / Dual-use (defence + civilian)	English	[W51]	[F14]

Avincis Aviation	Aviation / Helicopter Operations / MRO	English	[W52]	[F14]
Kongsberg	Defence / Aerospace	English	[W53]	[F14]
Kuva Space	Space / Satellite Engineering	English	[W54]	[F14]
Airbus Defence and Space Oy	Aerospace / Defence	English	[W15]	[F14]
Anduril Industries	Aerospace / Defence	English	[W55]	[F14]
OHB Sweden	Space	English	[W56]	[F14]
Skylo Technologies	Space	English	[W57]	[F14]
Air France Industries KLM	MRO	French	[W58]	[F15]
UUDS Aero	MRO	French	[W59]	[F15]
Airbus Helicopters SAS	MRO	French	[W60]	[F15]
CEiiA – Centre of Engineering and Product Development	Aerospace	English	[W17]	[F16]
QSR	Space	English	[W61]	[F16]
Keenfinity Group	Aerospace	English	[W17]	[F16]
Thales	Aerospace	English	[W17]	[F16]
Zionmill	Aerospace	English	[W17]	[F16]
Tekever	Aerospace (UAV´s)	English	[W17]	[F16]
SIMPLAC Tecnologia Mecânica, Lda.	Aerospace	English	[W17]	[F16]
Luza Group	Aerospace	English	[W17]	[F16]
Ogma	Aerospace/MRO	English	[W17]	[F16]
Lufthansa Technik Portugal	MRO	English	[W17]	[F16]
GMV	Space	English	[W17]	[F16]
FOSSA	Space	English	[W17]	[F16]
Critical FlyTech	Aerospace	English	[W17]	[F16]
MESA	MRO	English	[W17]	[F16]
Ryanair	MRO	English	[W17]	[F16]
ANA - Aeroportos de Portugal, SA	Airports	English	[W17]	[F16]
TAP Air Portugal	MRO	Portugal	[W62]	[F16]

Websites with job offers

[W1] https://leonardocompany.wd3.myworkdayjobs.com/en-US/LeonardoCareerSite/

[W2] https://www.eme-aero.com/en/job-offers/

[W3] https://careers-heli-one.icims.com/

[W4] https://globalhr.wd5.myworkdayjobs.com/en-US/REC_RTX_Ext_Gateway

[W5] https://www.kariyer.net/

[W6] https://fr.indeed.com/

[W7]https://www.linkedin.com/jobs/search/?currentJobId=4379839364&geoId=105015875&keywords=aerospace&origin

[W8] https://europa.eu/eures/portal/jv-se/home?lang=en

[W9] https://www.euroengineerjobs.com/

[W10] https://www.aerocontact.com/en/aerospace-aviation-jobs/aviation-job-offers.php

[W11] https://spaceindividuals.com/jobs

[W12] https://www.essp-sas.eu/human-resources/careers/

[W13] https://career-ohb.csod.com/

[W14] https://careers.ses.com/

[W15] https://www.airbus.com/en/careers

[W16] https://careers.thalesgroup.com/global/en/search-results

[W17] https://www.linkedin.com/jobs/

[W18] https://it.indeed.com/

[W19] https://app.ncoreplat.com/jobboard/filters/4277/sea-milan-airports

[W20] https://www.aernnova.com/careers

[W21] https://www.engineering-jobs.sener/jobs

[W22] https://es.talent.com/

[W23] https://careers.itpaero.com/

[W24] https://www.satlantis.com/job-offers/

[W25] https://batzgroup.talentclue.com/es/node/38823296

[W26] https://www.trigo-group.com/jobs/

[W27] https://potez.nous-recrutons.fr/

[W28] https://brusselsairlines.cvw.io/?lang=en-US

[W29] https://www.sabena-engineering.com/job/

[W30] https://jobs.eurocontrol.int/eurocontrol-vacancies/

[W31] https://www.skeyes.be/web/skeyes.be/v/34074

[W32] https://www.liegeairportacademy.com/fr/jobs/

[W33] https://lde.tbe.taleo.net/lde01/ats/careers/v2/jobSearch?org=SONACA&cws=38

[W34] https://www.asco.be/careers/

[W35] https://www.airbelgium.com/jobs/

[W36] https://careers.johncockerill.com/content/Our-jobs/?locale=en_GB

[W37] https://www.axon.com/careers/all

[W38] https://www.alten.be/career/jobs/

[W39] https://careers.reorbit.space/jobs

[W40] https://www.careerjet.co.uk/company/ICEYE/jobs

[W41] https://www.patriagroup.com/working-with-us

[W42] https://www.lockheedmartinjobs.com/search-jobs

[W43] https://www.space-careers.com/

[W44] https://www.gatelesis.com/career-opportunities/

[W45] https://www.avianation.com/jobs

[W46] https://career.limeflight.com/

[W47] https://ats.talentadore.com/

[W48] https://finavia.rekrytointi.com/paikat/index.php?o=A_LOJ&list=3&key=&rspvt=d0tbc7fp73sw8ggcoso0gs800goww0o

[W49] https://fastems.recruitee.com/

[W50] https://duunitori.fi/tyopaikat/tyo/aircraft-engineer-sdsuu-20160220

[W51] https://careers.kelluu.com/jobs

[W52] https://duunitori.fi/tyopaikat/tyo/helicopter-mechanic-sdsuu-20162995

[W53] https://www.kongsberg.com/careers/vacancies/

[W54] https://careers.kuvaspace.com/jobs

[W55] https://www.anduril.com/open-roles

[W56] https://careers.ohb-sweden.se/jobs

[W57] https://job-boards.greenhouse.io/skylotechnologies/jobs/7593941003

[W58] https://recrutement.airfrance.com/job/list-of-jobs.aspx?LCID=2057

[W59] https://www.hellowork.com/fr-fr/emplois/77393653.html

[W60] https://www.jobijoba.com/fr/

[W61] https://www.qsr.consulting/opportunities

[W62] https://recrutamento.tap.pt/

Files with job offers details

[F1] AEROFUSE_Job_offers_database with skills and competences_Leonardo.pdf

[F2] AEROFUSE_Job_offers_database with skills and competences_RJ. pdf

[F3] EGE, 18.03.2026, AEROFUSE_Job_offers_database with skills and competences _ shared (ege.). pdf

[F4] ESF, 20.03.2026, AEROFUSE_job offer database_Stephant(ESF). pdf

[F5] EWF_ AEROFUSE_Job_offers_database with skills and competences_. pdf

[F6] FDC 2, AEROFUSE_Job_offers_database with skills and competences _ sharedFDC_KarenBoniface. pdf

[F7] FDC, 18.03.2026, AEROFUSE_Job_offers_database with skills and competences _ shared-2_FDC_GF. pdf

[F8] FEA AEROFUSE_Job_offers_database with skills and competences _FEA. pdf

[F9] GEOSAT - AEROFUSE_Job_offers_database with skills and competences _. pdf

[F10] GISIG - AEROFUSE_Job_offers_database with skills and competences _ shared (2). pdf

[F11] IMH_HEGAN_AEROFUSE_Job_offers_database with skills and competences _. pdf

[F12] KULEUVEN - AEROFUSE_Job_offers_database with skills and competences _ KULEUVEN_160426. pdf

[F13] Laurea - AEROFUSE_Job offers database_Finland (40) (2). pdf

[F14] Laurea continuation - AEROFUSE_Job offers database_Finland & Nordics (134). pdf

[F15] PCA - AEROFUSE 2.2 Job offers PCA. pdf

[F16] QSR_IPN_worked_together - AEROFUSE_Job_offers_database with skills and competences _ shared (002). pdf

Annex 6 – List of sample interview questions

What are the key technological trends currently affecting the aerospace sector?

Which technologies are expected to have the greatest impact on the sector in the next five years?

What skills and competences are currently most important for employees in the aerospace sector?

Which skills and competences are expected to become more important in the future?

Are there any skills gaps currently observed in your organization or sector?

Which job roles are currently the most difficult to recruit for?

Which new or significantly changing job roles do you expect to emerge in the aerospace sector?

How are digital transformation and automation affecting skills needs and job roles?

How are green transition and sustainability requirements affecting workforce needs?

What are the main barriers to developing or acquiring the required skills?

How well do current education and training offers respond to the needs of the aerospace sector?

What changes in education, training or upskilling activities would be most useful for the sector?

Do the findings from desk research and survey results reflect your experience and observations?

Are there any important technologies, skills, competences or job roles that have not been sufficiently captured in the previous analysis?

What recommendations would you suggest for future workforce development in the aerospace sector?

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Annex 7 – Form for interviews registration

No	Date	Job position of the interviewee	Company	Specialization

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Annex 8 – Preliminary survey findings

Available in PDF file: Annex8_to_D2.2_PreliminarySurveyFndings_AEROFUSE.pdf

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Annex 9 – Python script – ESCO simple browser

1. Introduction

This annex presents the Python script developed to support the exploration and reading of ESCO data within the AEROFUSE project. The script is used as a practical tool to browse ESCO entries, inspect the relationships between occupations, skills, and competences, and facilitate the identification of relevant terms for the Body of Knowledge.

The script is intended to support the analytical work carried out in Task 2.2 by making ESCO data easier to access, filter, and review in a structured way. It complements the broader methodological framework described in Deliverable D2.2.

2. Purpose of the Python Script

The purpose of the script is to provide a simple and transparent way to work with ESCO datasets during the construction of the AEROFUSE Body of Knowledge. In particular, it helps to:

- identify relevant occupations, skills, and competences;
- inspect the ESCO hierarchy and terminology;
- explore connections between occupational profiles and associated skills;
- support the standardisation of terminology used across the project;
- assist with validation of sector-relevant concepts before they are incorporated into the analytical framework.

The script is not designed to replace expert interpretation. Its role is to support the analytical process by making ESCO browsing more efficient and reproducible.

3. Scope and Functionality

The script provides a lightweight browsing and inspection environment for ESCO data. Its main functions include:

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- loading ESCO-related structured data files;
- searching for specific occupations, skills, and competences;
- displaying selected records in a readable format;
- filtering entries by keywords or identifiers;
- supporting manual review of relevant ESCO concepts;
- enabling quick comparison of terms used in ESCO with terms identified in other project sources.

The script may be adapted to different ESCO datasets or updated versions of the classification, depending on the analytical needs of the project.

4. Data Sources and ESCO Structure

The script works with ESCO data structured around occupations, skills, competences, and relationships between these elements. ESCO is used as a reference framework to ensure consistency in terminology and to support comparability with other European classification systems.

In the AEROFUSE context, the script is used to examine how sector-relevant concepts align with ESCO categories and to identify:

- whether a term already exists in ESCO;
- which occupation or skill group it belongs to;
- whether the term needs to be interpreted more broadly or narrowly;
- whether additional project-specific concepts should be documented separately.

This supports the development of a coherent terminology base for the Body of Knowledge.

5. Script Workflow

The script follows a simple workflow:

- Load ESCO data: the relevant dataset is opened and prepared for browsing.
- Search and filter terms: the user can search for keywords, identifiers, or concept names relevant to the aerospace sector.
- Review matched entries: the script displays the corresponding occupation, skill, or competence records in a readable format.
- Check relationships. the user can inspect links between occupations and associated skills or related concepts.
- Select relevant terms: the most relevant entries are identified for inclusion in the analytical results or for further validation by experts.
- Export or document findings: selected terms can be documented and used as part of the wider Skills Intelligence process.

6. Output and Use in the AEROFUSE Project

The script supports the AEROFUSE work on skills intelligence by improving the efficiency of ESCO-based analysis. It helps the project team to:

- verify terminology used in survey analysis, interviews, and document review;
- align emerging competence descriptions with an established European framework;
- support coding and classification of skills, occupations, and technologies;
- reduce ambiguity when mapping sector-specific language to standardised ESCO concepts.

The output of the script is used as an input to the broader methodological process rather than as a final result in itself.

7. Limitations and Maintenance Notes

The script is a support tool and has the following limitations:

- it depends on the quality and completeness of the ESCO dataset used;
- it may require adjustments when ESCO structure, file format, or identifiers change;
- results still require expert review and interpretation;
- it should be maintained in line with any updates to the AEROFUSE analytical framework.

Future improvements may include expanded search functions, additional filtering options, better export capabilities, and closer integration with the project's wider knowledge management workflow.

8. Python Script

```
import os
import tkinter as tk
from tkinter import filedialog, messagebox
from collections import defaultdict
import pandas as pd

# ========================
# DATA
# ========================
class ESCOData:

  def __init__(self):
    self.occ_to_skill = defaultdict(list)
    self.skill_to_occ = defaultdict(list)

  def load_folder(self, folder):

    occ_file = skill_file = rel_file = None

    for root, _, files in os.walk(folder):
      for f in files:
        if f == "occupations_en.csv":
          occ_file = os.path.join(root, f)
        elif f == "skills_en.csv":
          skill_file = os.path.join(root, f)
        elif f == "occupationSkillRelations_en.csv":
          rel_file = os.path.join(root, f)
```

```
    if not occ_file or not skill_file or not rel_file:
        print("❌ ESCO files not found")
        return False

    occ_df = pd.read_csv(occ_file, dtype=str)
    skill_df = pd.read_csv(skill_file, dtype=str)
    rel_df = pd.read_csv(rel_file, dtype=str)

    occ_map = {}
    skill_map = {}

    for _, r in occ_df.iterrows():
        if pd.notna(r["conceptUri"]) and pd.notna(r["preferredLabel"]):
            occ_map[r["conceptUri"]] = r["preferredLabel"]

    for _, r in skill_df.iterrows():
        if pd.notna(r["conceptUri"]) and pd.notna(r["preferredLabel"]):
            skill_map[r["conceptUri"]] = r["preferredLabel"]

    for _, r in rel_df.iterrows():
        occ_uri = r["occupationUri"]
        skill_uri = r["skillUri"]

        if occ_uri in occ_map and skill_uri in skill_map:
            occ = occ_map[occ_uri]
            skill = skill_map[skill_uri]

            self.occ_to_skill[occ].append(skill)
            self.skill_to_occ[skill].append(occ)

    print("✅ Data loaded")
    return True


# ========================
# APP
# ========================
class ESCOApp:

    def __init__(self, root):
```


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```
        self.root = root
        root.title("ESCO Simple Browser")
        root.geometry("700x400")

        self.data = ESCOData()
        self.mode = tk.StringVar(value="skill")

        # ---------- TOP ----------
        top = tk.Frame(root)
        top.pack(fill="x", pady=5)

        tk.Radiobutton(top, text="Skills", variable=self.mode, value="skill").pack(side="left")
        tk.Radiobutton(top, text="Occupations", variable=self.mode,
value="occ").pack(side="left")

        self.entry = tk.Entry(top, width=50)
        self.entry.pack(side="left", padx=5)

        tk.Button(top, text="Search", command=self.search).pack(side="left")
        tk.Button(top, text="Info", command=self.show_info).pack(side="left")

        # ---------- MAIN ----------
        main = tk.PanedWindow(root)
        main.pack(fill="both", expand=True)

        left = tk.Frame(main)
        right = tk.Frame(main)

        main.add(left, minsize=200)
        main.add(right, minsize=200)

        # ---- LEFT PANEL ----
        left_frame = tk.Frame(left)
        left_frame.pack(fill="both", expand=True)

        tk.Button(left_frame, text="Copy Results", command=self.copy_results).pack(fill="x")

        self.results = tk.Listbox(left_frame)
        self.results.pack(fill="both", expand=True)
        self.results.bind("<<ListboxSelect>>", self.on_select)
```

```
        # ---- RIGHT PANEL ----
        right_frame = tk.Frame(right)
        right_frame.pack(fill="both", expand=True)

        tk.Button(right_frame, text="Copy Details", command=self.copy_details).pack(fill="x")

        self.details = tk.Listbox(right_frame)
        self.details.pack(fill="both", expand=True)

        # ---------- LOAD ----------
        tk.Button(root, text="Load ESCO Folder", command=self.load).pack(pady=5)

    # ---------------- LOAD ----------------
    def load(self):
        folder = filedialog.askdirectory()
        if not folder:
            return

        self.data = ESCOData()

        if not self.data.load_folder(folder):
            messagebox.showerror("Error", "Could not load ESCO data")
            return

        self.skills = list(self.data.skill_to_occ.keys())
        self.occs = list(self.data.occ_to_skill.keys())

        print("✅ App ready")

    # ---------------- SEARCH ----------------
    def search(self):
        query = self.entry.get().lower()

        self.results.delete(0, tk.END)

        data = self.skills if self.mode.get()=="skill" else self.occs

        for item in data:
            if query in item.lower():
                self.results.insert(tk.END, item)
```

```
    # ---------------- SELECT ----------------
    def on_select(self, event):
        sel = self.results.curselection()
        if not sel:
            return

        item = self.results.get(sel[0])
        self.details.delete(0, tk.END)

        if self.mode.get()=="skill":
            related = self.data.skill_to_occ.get(item, [])
        else:
            related = self.data.occ_to_skill.get(item, [])

        for r in sorted(set(related)):
            self.details.insert(tk.END, r)

    # ---------------- COPY RESULTS ----------------
    def copy_results(self):
        items = self.results.get(0, tk.END)

        if not items:
            return

        text = "\n".join(items)

        self.root.clipboard_clear()
        self.root.clipboard_append(text)
        self.root.update()

        messagebox.showinfo("Copied", "Results copied to clipboard")

    # ---------------- COPY DETAILS ----------------
    def copy_details(self):
        items = self.details.get(0, tk.END)

        if not items:
            return

        text = "\n".join(items)
```


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```
        self.root.clipboard_clear()
        self.root.clipboard_append(text)
        self.root.update()

        messagebox.showinfo("Copied", "Details copied to clipboard")

    # ---------- INFO ----------
    def show_info(self):
        messagebox.showinfo(
            "Info",
            "Author: Arkadiusz Bednarz\nRzeszow University of Technology\n11th May 2026\nAEROFUSE PROJECT"
        )


# ========================
# RUN
# ========================
if __name__ == "__main__":
    root = tk.Tk()
    app = ESCOApp(root)
    root.mainloop()
```

9. Closing Note

This annex documents the Python-based ESCO browsing tool used in Task 2.2 to support the structured analysis of occupations, skills, and competences within the AEROFUSE project. The script contributes to the traceability, consistency, and transparency of the ESCO-based analytical process.