Federal Ministry
Republic of Austria
Defence

Austrian Defence Research Strategy 2032+

Linguistic equality

The personal expressions used in this strategy apply equally to all genders, insofar as this is relevant to the content.

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1 Forewords

1.1 Foreword by the Federal Minister of Defence

Federal Minister of Defence Klaudia Tanner

With the Austrian Defence Research Strategy 2032+, the Federal Ministry of Defence and the Austrian Armed Forces have made a strong commitment to defence research. Defence research is regarded as an essential, active contribution to supporting national security and defence policy. Research in this area strengthens national resilience and is an important factor for a secure and peaceful future for our country. The results and developments of defence research will enable Austria's future generations to defend themselves against attacks of all kinds and deter attempted attacks in advance.

To ensure that, in the future, this fundamental security can be guaranteed by the state and in particular by the Austrian Armed Forces, research into future threats and means of defence against them must begin today. One thing is certain: all over the world, the defence technologies of tomorrow are already being researched today. We cannot afford to allow potential aggressors a lead lest we will not be able to catch up with them in the future.

> "Defence research is regarded as an essential, active contribution in support of national security and defence policy. Research in this area strengthens national resilience and is an important factor for a secure and peaceful future for our country."

We therefore see the planned increase in Austrian defence spending as an opportunity that should also be used to significantly increase funding for defence research. There is a particular focus on important future topics such as digitalisation and space. The aim is to increase investment in defence research in proportion to the planned increase in defence spending. This will enable us to reach, at least in the medium term, the current level of research spending in comparison with other European countries.

Intensifying research activities, as envisioned in the Defence Research Strategy 2032+, requires structural and content-related adjustments in addition to the commitment of financial resources. Sufficient personnel are needed; they should exhibit the necessary excellence and have the time resources to recognise and identify research needs, participate in research projects, and transfer consequent research results to the organisation. At the same time, however, successful defence research requires additional capacities for planning, participating in, and managing the research process. Given the increasingly scarce supply of labour, this additional need for employees will have to be met in competition with other employers. The defence research strategy offers targeted approaches for this as well. In terms of content, the Defence Research Strategy 2032+ represents a partial reorientation of Austrian defence research. While short- to medium-term issues will continue to be addressed, there will also be a stronger focus on long-term, future

issues; this will help shape individually selected technologies. To this end, there will be closer coordination with capability and armaments planning.

At the national level, the planned investment in defence research is an important prerequisite for maintaining and developing knowledge and skills in the defence sector. In addition, defence research investments not only trigger considerable macroeconomic effects but also lead to positive technological spill-over effects benefitting both the defence sector and the civilian sector of the economy. The increase in funding for defence research therefore improves industrial competitiveness and, thereby, contributes to Austria‘s appeal as a business location.

By implementing the Defence Research Strategy 2032+, the Austrian Armed Forces are also securing their European integration capability in the long term. In the European context, defence research contributes to the strategic autonomy and increased resilience of the EU.

1.2 Foreword by the Secretary General at the Federal Ministry of Defence

Dr Arnold H. Kammel, Secretary-General at the Federal Ministry of Defence

The aim of the Defence Research Strategy is, on the one hand, to improve transparency and, on the other hand, to optimise the use of defence research. This will allow for providing the best possible support to fulfil the future tasks of the Federal Ministry of Defence and the Austrian Armed Forces (MOD/AAF). However, defence research should not only be regarded as a military task but rather as a task for the entire state as a part of comprehensive national defence. Therefore, it must be increasingly positioned in civilian, intellectual, and economic dimensions of national defence. Therefore, the next step in implementing the Strategy's measures is to establish defence research as an important instrument of the new Austrian Security Strategy. Furthermore, defence research should be taken into account while designing the next national RTI Strategy.

In terms of European strategic autonomy, the importance of the European Defence Fund (EDF) as a European funding programme and financial incentive programme to promote cross-border cooperation in defence research cannot be overestimated. Austria, of course, contributes to the EDF budget in accordance with EU agreements. Consequently, return on investment for Austria through successful project participation by Austrian players is an understandable ambition of the Defence Research Strategy. Fortunately, the national success rate of submitted projects has already increased from 34% in 2022 to 61% in 2023.

> "Defence research should not only be regarded as a military task but rather as a national task as part of comprehensive national defence; therefore, it must be increasingly positioned in civilian, intellectual, and dimensions of economic national defence. Both the Austrian Armed Forces as carrier of technology and the Austrian economy as well as Austria as a centre of business and technology benefit from this research."

The primary beneficiaries of this successful participation are not only the Austrian Armed Forces as a technology provider but also the Austrian economy and Austria as a centre of business and technology. Small and medium-sized Austrian companies in particular could benefit from better networking with European players in the defence market. In the medium to long term, this goes hand in hand with a better strategic positioning of Austrian interests, in compliance with ethical principles, in the European context.

By increasing European and national security, creating high-quality jobs in research and industry, sharing costs while gaining full scientific and technological know-how, primarily in the high-tech sector, and reclaiming taxpayers‘ money, the Austrian population ultimately also benefits considerably from defence research.

Convinced of the absolute necessity of defence research as a valuable contribution to increasing national security, I will therefore continue to advocate the availability of the necessary resources.

1.3 Foreword by the Chief of Defence Staff of the Austrian Armed Forces

General Rudolf Striedinger, Chief of Defence Staff of the Austrian Armed Forces

Defence research is essential for the Austrian Armed Forces and, therefore, for Austria's security. The needs that the Austrian Armed Forces have due to their constitutional tasks are far-reaching and in some cases extend over a long time frame. These include the armed forces' need to be able to respond appropriately to threats in real time during a mission. Decision-making in various task areas (e.g. capability development, procurement, etc.) also requires scientific and technical support. Ultimately, the Austrian Armed Forces must also be able to anticipate future threat scenarios.

In all these areas, defence research makes an often unseen but indispensable contribution to the development of the Austrian Armed Forces' capabilities and thus makes a significant contribution to preparing the Austrian Armed Forces for the challenges of the future. According to the Austrian Security Strategy, defence research should „ensure the best national and European technological innovations for Austrian soldiers in the event of deployment". The Defence Research Strategy 2032+ now provides the guidelines for the successful implementation of defence-related research.

> "Defence research makes an often unseen but indispensable contribution to the capability development of the Austrian Armed Forces and thus contributes significantly to preparing the Austrian Armed Forces for the challenges of the future."

Defence research provides the Austrian Armed Forces with defence solutions that either are not available on the market or need, from a strategic point of view, to be better than those available on the market. Defence research is also essential in order to ensure independence or a necessary advantage over third parties in various areas. This applies to, on the one hand, Austria as a sovereign nation and, on the other hand, cooperation at the European level. Especially for solutions that require highly differentiated knowledge, large budgets, and R&D infrastructure for research and development, joint research projects between EU countries are an important option. These provide the Austrian Armed Forces with access to research and development results that could not be achieved with national resources alone. Furthermore, through cost sharing and partial funding, EU projects allow individual states and, therefore, Austria, to save costs. The transnational defence research projects additionally lead to greater independence and resilience vis-à-vis third countries as well as better coordination and compatibility of European defence systems within Europe.

1.4 Foreword by the Head of the Directorate for Defence Policy and International Relations

Major General Peter Vorhofer, PhD, Head of the Directorate for Defence Policy and International Relations at the Federal Ministry of Defence

Just a few years ago, my civilian and military interlocutors, both national and international, expressed a certain amount of astonishment at the broad thematic approach Austria chose for its defence research. However, there is a good reason for this approach, as the comprehensive, interdisciplinary and cooperative-interoperable approach is indispensable for the fulfilment of the current and, above all, future tasks of the Federal Ministry of Defence and the Austrian Armed Forces (MOD/AAF).

From a defence policy perspective, both the advisory and supporting role of defence research in the context of the national risk picture and the implementation of the EU Strategic Compass should be emphasised. In this context, defence policy necessities such as reducing dependencies, increasing autonomy, the need to deal with current security policy and technological developments and their foreseeable consequences, and, ultimately, preparing the armed forces, but also the public, for these defence policy necessities are guiding questions (in the area of) of defence research.

> "The comprehensive, interdisciplinary, and cooperative-interoperable approach is indispensable for the fulfilment of current and, above all, future tasks of the MOD/AAF. The added value of national and European cooperation in the context of defence research has been proved by initial evaluations."

From a defence policy perspective, there is currently a much broader awareness and a positive national and European public perception of our approach to defence research. This great success, which has been achieved through, among other things, many years of successful interministerial cooperation within the framework of the so-called security bracket (KIRAS, FORTE) and the recent success in acquiring funding from the European Defence Fund for the benefit of the MOD/AAF.

Following initial evaluations, the scientific and economic added value of national and European cooperation in the context of defence research has also been proved. In addition, defence research is increasingly earning the MOD a good reputation and has created a high level of trust in military-civilian project cooperation within the R&D community. In some areas, the Austrian Armed Forces also have a unique national selling point that is highly valued by civilian partners in the context of R&D projects, as the research and testing of certain capabilities is only possible in the military. All of this forms an indispensable basis for the joint work for the security of us all.

The positive developments of recent years are now to be further expanded and strengthened through the measures outlined in the defence research strategy. By successively implementing the proposed measures of the defence research strategy, defence research will be able to exploit its potential even better in order to contribute to further targeted competence building and capability development in line with requirements. At the same time, it will make a significant contribution to the anticipatory shaping of national security and defence policy; as such, it should also be perceived even more strongly in the overall national context.

In any case, the MOD will continue to present itself as a reliable partner in defence research in the future, and I, in my role, will continue to be a staunch supporter of defence research concerns.

1.5 Foreword by the Defence Research and Technology Director

Brigadier General Rudolf Zauner, Defence Research and Technology Director at the Federal Ministry of Defence

The current geopolitical situation, the speed at which the environment is changing, and rapid technological developments are impacting the 2032+ defence research strategy in a number of ways. On the one hand, they bring with them complex and destabilising threats and influence real and potential dangers; on the other hand, they force the Austrian Armed Forces to develop new capabilities or improve existing ones in order to prevent their operational capability from eroding. Furthermore, future defence capability depends on whether we, together with the forces, succeed in applying new technologies sensibly and, above all, in a timely manner.

In order to be able to counter future threats, the armed forces need modern capabilities, and, above all, soldiers need the best possible protection. To this end, it is necessary for the armed forces to drive the development of modern technologies to achieve operational readiness and to master and utilise them innovatively. The Defence Research Strategy 2032+ will create the necessary conditions and support the development of the armed forces.

> "Successful and effective defence research requires excellent personnel, suitable infrastructure and sufficient budget. Defence research must be seen as an investment in the future, in new capabilities and in the modernisation of the armed forces and must be approved and supported by the leadership at all levels."

Defence research and technology-driven modernisation of the Austrian Armed Forces can only be accomplished in cooperation with civilian research institutions and industry as well as at European level. Defence research must therefore be aligned with European developments in terms of its objectives and purpose and implemented within the framework of national and international research cooperation. In this context, expenditure on defence research is a targeted investment, as successful defence research is a decisive factor for operational readiness.

Defence research must be prepared for changes in the environment and rapid technological developments and must therefore be extended to a 2040 time horizon. Comprehensive national defence as a response to threats requires interdisciplinary and thematically broad-based defence research. Like all beneficial research, successful and effective defence research requires the necessary framework conditions, in particular excellent personnel, infrastructure, and a budget that is sufficient by international standards. Defence research must therefore be seen as an investment in the future, in

new capabilities, and in the modernisation of the armed forces, and it must be approved and supported by the leadership at all levels.

People are and will remain the factor of success in defence research. Defence research can only ever be as good as the people who define the research needs, help carry out the research, and ultimately apply the research and development results.

In general, it is impossible to predict which threats will occur when, how, and in what form. However, it can be said with certainty that, with defence research, we are much better prepared for future threats.

Credits: Bernhard Bergmann/Joanneum Research

2 Introduction and Motivation

In a world characterised by asymmetric threats, cyber attacks, and new security policy dynamics, national security is facing unprecedented challenges. At the same time, innovations and leaps in development are constantly taking place in the field of technology and development, making it increasingly difficult to be up to date and in possession of adequate defence instruments. The Austrian Defence Research Strategy 2032+ represents a comprehensive, long-term concept that is intended to help overcome these diverse challenges. It is intended to create the basis for the timely development of the tools and capabilities required by the Austrian Armed Forces. This strategy outlines which framework conditions and which subject areas are required for the implementation of successful defence research in the future. The focus is on important partnerships, customised processes, human and financial resources, communication and a balanced portfolio of topics.

The Defence Research Strategy is therefore an important mechanism for consolidating Austria's defence capabilities and supporting them in new areas. It promotes and strengthens innovation, the shaping of the national defence industrial base and cooperation with European and international partners.

According to the 2032 risk picture, hybrid threats will present a significant danger to Austria's security over the next ten years. Our country is currently still inadequately prepared for such scenarios. Being able to counter these threats with the right means is an important basis for determining the necessary future capabilities of the Austrian Armed Forces (AAF) – and therefore also for the tasks of defence research. A nationwide approach to comprehensive national defence is required here. At the same time, interdisciplinary approaches[1] are needed in defence research. Defence research is well anchored in the relevant national strategic policy documents and concepts. This provides a solid basis for the Defence Research Strategy. The new security strategy emphasises that Austria absolutely needs targeted defence research and that long-term topic planning is important for this. The Military Strategic Concept (MSC) also emphasises the ability for strategic anticipation and early detection as well as active participation in defence research (also in the area of overall national security policy).

There is potential for synergies and opportunities for complementary measures with strategy papers from the civilian sector, especially with the Federal Government's Strategy for Research, Technology and Innovation 2030 (RTI Strategy 2030) and the Space Strategy 2030+.

At a national level, defence research is an important prerequisite for maintaining and expanding capabilities and technologies in the defence industry as well as in the Austrian Armed Forces. In addition, government investment in national defence research motivates companies and other organisations to invest in these research areas themselves, to train personnel in this area and to use Austria as a location for such research. Another positive effect for Austria as a business location is the increase in knowledge and experience generated by the researching companies and organisations and the possibility of considering civilian applications for at least some of the technologies researched.
Defence research, as envisaged in this strategy, should get the most out of the investments made and be used as effectively and efficiently as possible. This is made possible, among other things, through cooperation with national, European and other strategic partners. Thanks to these cooperations, the stakeholders in the Federal Ministry of Defence and the Austrian Armed Forces (MOD/AAF) have access to scientific findings and applications from a broad group of innovators.

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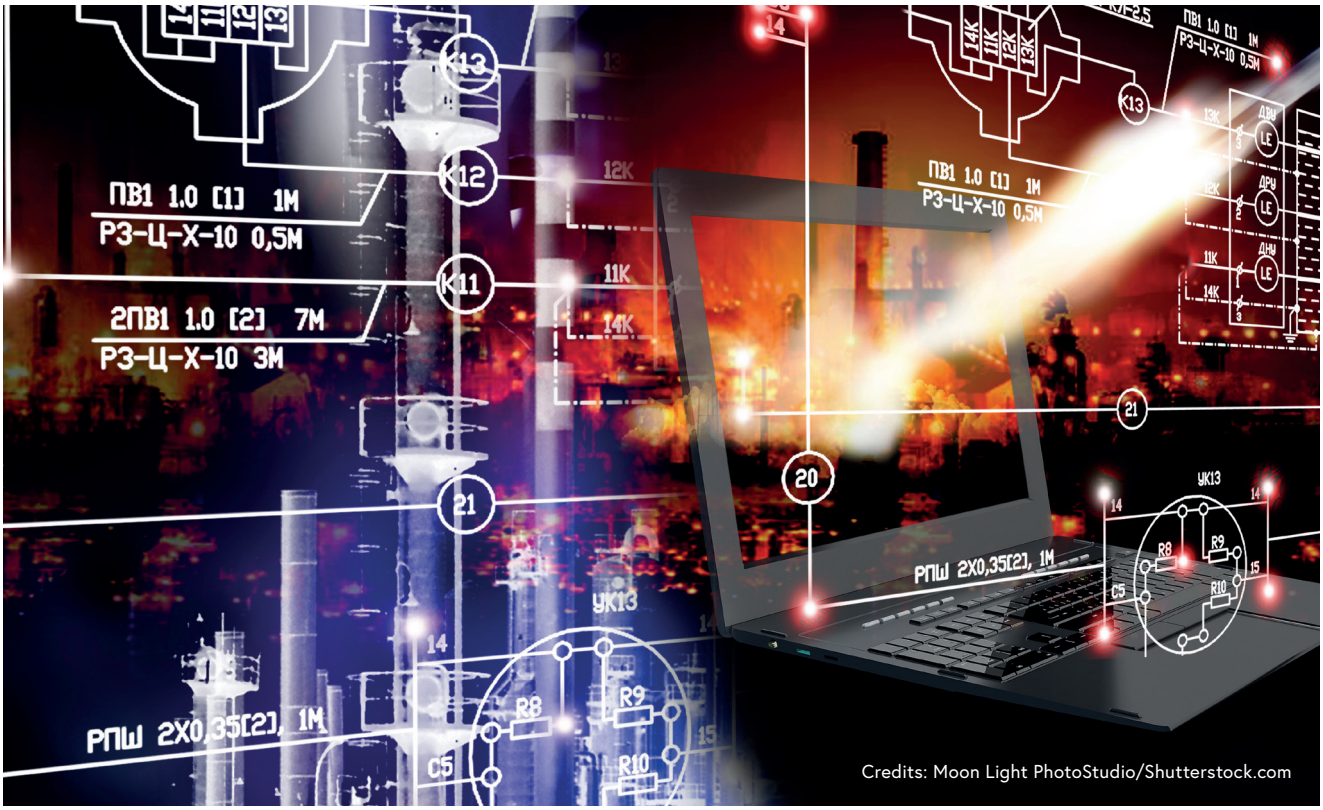
[1] This refers to the co-operative use and further development of approaches, ways of thinking or methods from different scientific disciplines.

In the European context, defence research should make a contribution to the strategic autonomy and increased resilience of the European Union (EU). The European defence sector is currently lagging behind in terms of technological research, development and innovation. In order to reduce the EU's strategic dependence on external actors, the European states must increase their investment in research and technological innovation and identify key areas within those fields. For Austria, this means, among other things, that the fields of research and technology defined by the MOD have had to be repeatedly reassessed due to the rapid pace of development and new priorities have had to be set.

The EU Strategic Compass of 2022 makes it clear that the primary framework for Austria's security and defence policy is set by its membership of the European Union. This has two consequences for Austrian defence research: On the one hand, the interoperability of the AAF is an important guiding principle for the future direction of Austrian defence research. This concerns both the thematic focus and the optimal use of the opportunities offered by the European Defence Fund (EDF). On the other hand, special attention must also be paid to inter-European and international cooperation in defence research in the future. The Strategic Compass describes the North Atlantic Treaty Organization (NATO) as an „essential" partner of the EU in matters of defence. In the EU-NATO Joint Declaration of January 2023, both sides stressed increased cooperation. Accordingly, it can be assumed that the exchange between NATO and the EU will also increase in terms of defence research. It is therefore important to consider the areas in which Austria is seeking solutions at a purely European level and in which areas transatlantic cooperation can provide more promising impetus in order to contribute to the desired technological and military sovereignty of the EU.

Ethical and legal considerations in defence research are complex and require a careful balance between security requirements and fundamental values and norms. A transparent and responsible approach is crucial to ensure that progress in defence research is in line with ethical principles and international law.

Chapter 3 of this strategy defines the vision for defence research 2032+ in the MOD/AAF and sets out seven strategic objectives. Chapter 4 derives fields of action with concrete measures from these objectives. Chapter 5 presents the time and resources required to implement these measures. Chapter 6 sets out indicators for monitoring the strategy in relation to its timeframe and to measure the strategy's successful implementation.



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3 Vision and Strategic Objectives

3.1 Vision

Defence research actively contributes to supporting national security and defence policy, shapes the military science and technological research and development (R&D) of the Federal Ministry of Defence and the Austrian Armed Forces, and contributes to strengthening national resilience. The R&D activities of the MOD/AAF thus provide essential foundations for the long-term development of national defence capabilities. This also positions the MOD/AAF as an important, reliable and competitive partner for research and development in the context of European capability development.

Defence research also proactively enhances the ability to be adequately prepared for challenges arising from the global security environment and new technological developments. Defence research not only generates new knowledge and innovations, but also produces the necessary know-how for the planning, production, application and further

development of defence capabilities. Within the framework of military science, R&D creates the basis for research-led teaching.

The MOD/AAF have an internally and externally recognised research system that produces the necessary research and development products in the required quality and degree of maturity through an interdisciplinary and well-organised research process. The research structures (research, planning and procurement personnel) are flexible and adaptable. There are sufficient and competent personnel to actively and continuously participate in the research process. Financial resources are available for defence research on an internationally comparable scale. There are uncomplicated options for access to funding programmes and targeted collaborations that are useful for all parties involved. Effective mechanisms for control, communication and quality assurance have been implemented and are regularly applied.

3.2 Objectives

The aim of research and technology development is, on the one hand, to generate the state-of-the-art and needs-based knowledge in the field of military science and, on the other hand, to find optimal technological possibilities and applications for long-term capability development.

Strategic Objectives:

1. **Support future-oriented armed forces and capability development in the best possible way and create innovative defence solutions for the Federal Ministry of Defence / Austrian Armed Forces**
   Future emerging threats and disruptive technologies are anticipated at an early stage and appropriate active responses are developed. Defined strategic research and development areas (SRDA) are utilised for capability development and suitable framework conditions (structures, processes, budget, personnel, legislation) are created for research activities. The rapid, innovation-driven and future-orientated further development of the armed forces is made possible through knowledge and technology transfer.

2. **Create transparency within the department with regard to research activities and their results**
   In the future orientation of research and technology development at the Federal Ministry of Defence (MOD)/Austrian Armed Forces (AAF), the communication and visibility of research activities will be further strengthened. Broader access to research results will create better usability and thus greater benefits for the MOD/AAF.

3. **Further develop the national research community**
   Development and promotion of an agile innovation ecosystem within the MOD/AAF, the national research communities, and industry in order to ensure both the rapid implementation of research results in operational capabilities and to strengthen the defence industrial base in Austria.

4. **Anchoring defence research as a national task and an equal subject area in national research, technology and innovation (RTI governance)**
   In addition to military national defence, defence research should also cover the areas of intellectual, civil and economic national defence. Accordingly, the relevant ministries should be invited to join a working group under the leadership of the MOD in order to develop a joint research agenda.

5. **Maintain and further expand national, European and international cooperations/partnerships**
   The MOD will continue to actively participate in research cooperation and strengthen its defence policy relationships with like-minded nations and organisations. The successful participation in funded national and European defence research projects (e.g. the national defence research programme FORTE, EDF, etc.) will be further expanded and used innovatively for the MOD/AAF.

6. **Make national defence sustainable**
   The MOD/AAF is committed to sustainability[2] and environmental responsibility in the defence sector. The climate goals of the MOD/AAF are taken into account in the survey of research requirements and in the assessment of all projects as a cross-sectional issue. Environmentally friendly technologies are integrated, the carbon footprint of the Armed Forces is reduced and resources are managed responsibly, provided that this does not impair the operational readiness of the AAF.

7. **Attract and develop personnel for defence research**
   Highly skilled and motivated personnel in defence research and technology are encouraged. Investing in education, training and career development opportunities will attract and retain top talent to drive innovation in the defence sector.

[2] In terms of the implementation of research-relevant aspects of the Federal Ministry of Defence's thematic policy 'Climate change and defence' of 2022

3.3 Impact pathways of the strategic objectives

The strategic objectives can be summarised into three complementary impact pathways. An impact pathway is a simplified causal chain of events („productive interactions“) that links the activities carried out in the Defence Research Strategy with identifiable effects on the economy and society in a broader sense. The three impact pathways thus create a framework for the intended effects of strategy implementation over the next 15 years (see figure 1).

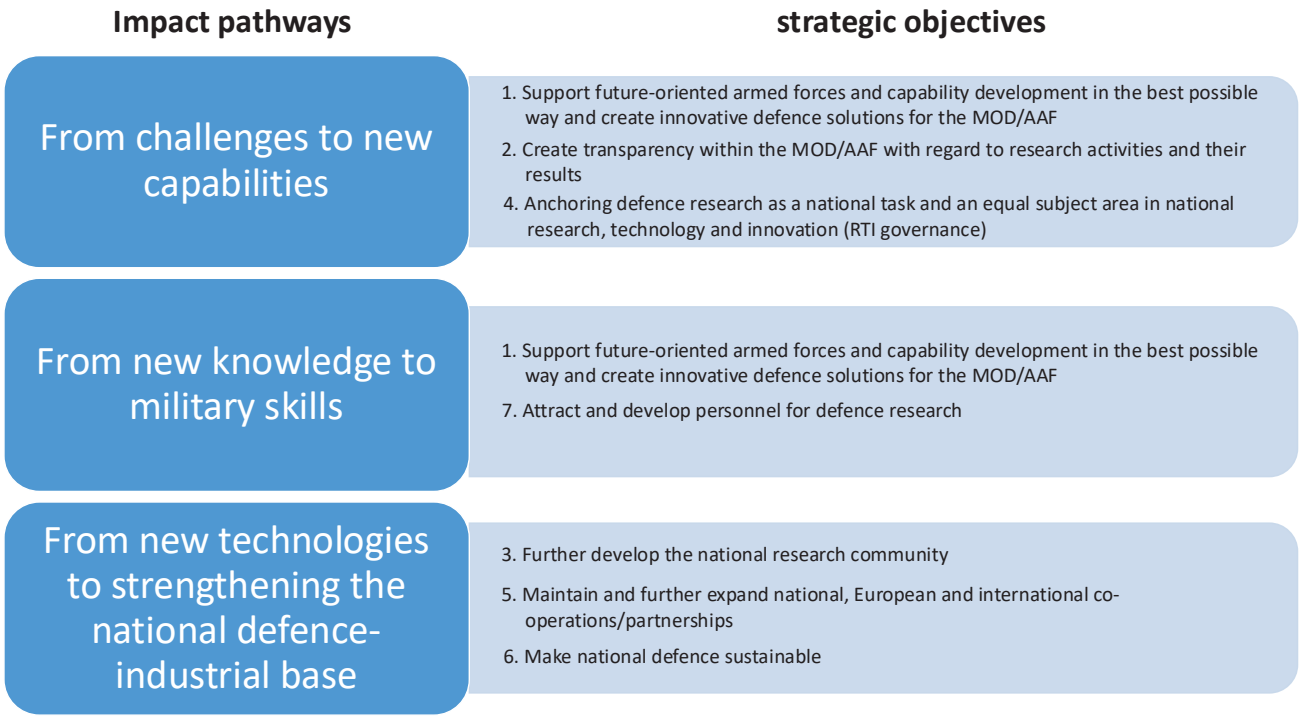


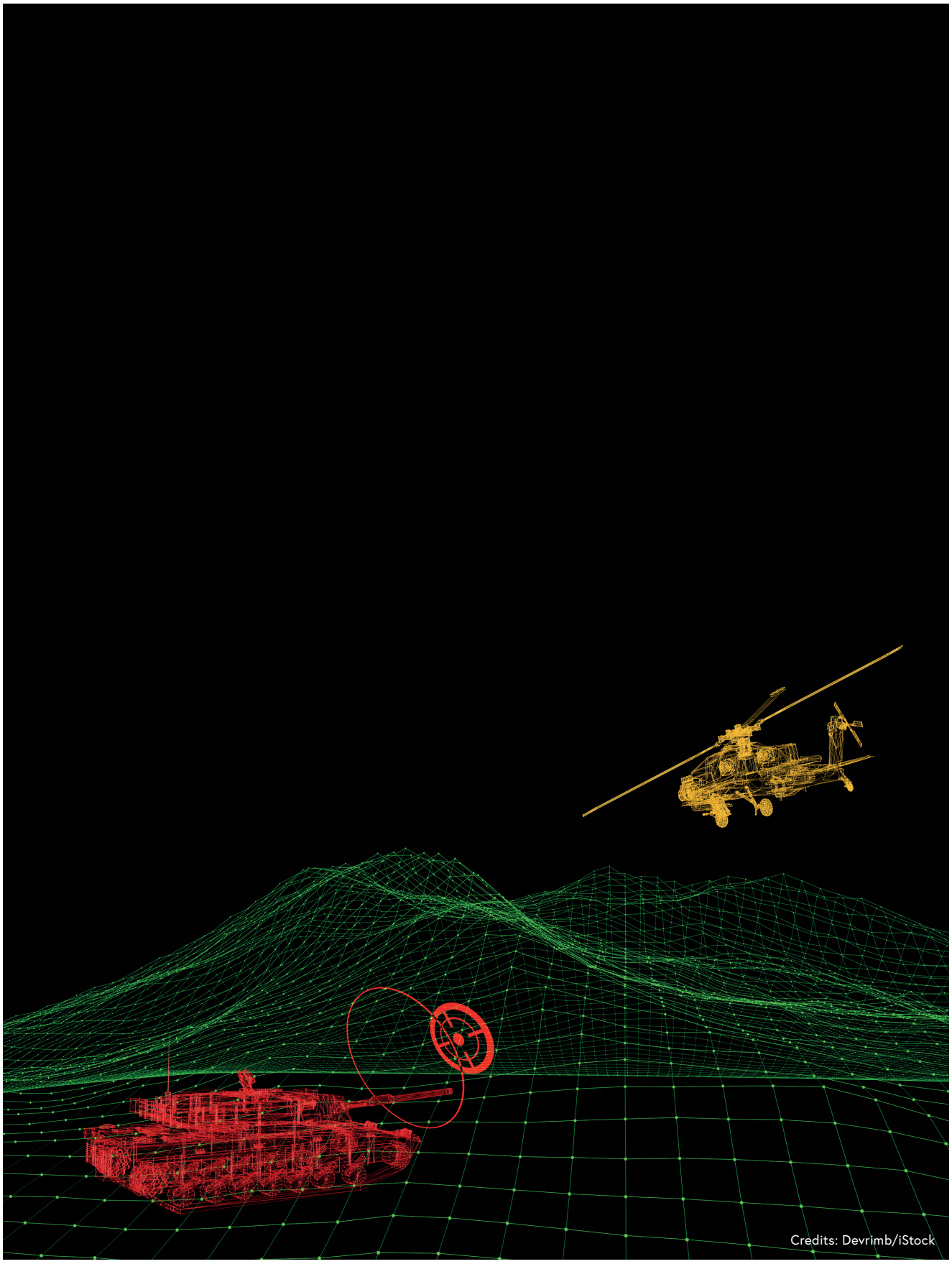
Figure 1: Impact Pathways to the strategic objectives

3.4 What does it take to achieve these goals?

In order to exploit its full potential, defence research requires not only appropriate resources, but also broad acceptance at all levels of the organisation. This acceptance is reflected in a positive attitude towards research, its tasks and its results.

It also requires

- Recognition of the value and potential benefits of defence research,
- Standardised terminology and a uniform understanding of research,
- Flexibility of structures,
- Resources and willingness to participate in research and development,
- Acceptance of research results,
- The will to test research results and implement them innovatively,
- Awareness that defence research can often only generate long-term effects,
- Willingness to take risks, because research per se is open-ended,
- An open culture of error: recognising mistakes, examining causes and learning from them,
- A corporate culture that promotes innovation and uses the full potential of the organisation through a broad innovation base with low-threshold opportunities for input,
- Enjoying the exchange of knowledge and insights with external partners (national and international),
- Interest in improving/learning from good practices,
- Reliability of planning: the validity of commitments to research projects beyond years/changes of leadership/legislative periods,
- Recognition that excellence must always be kept up to date.



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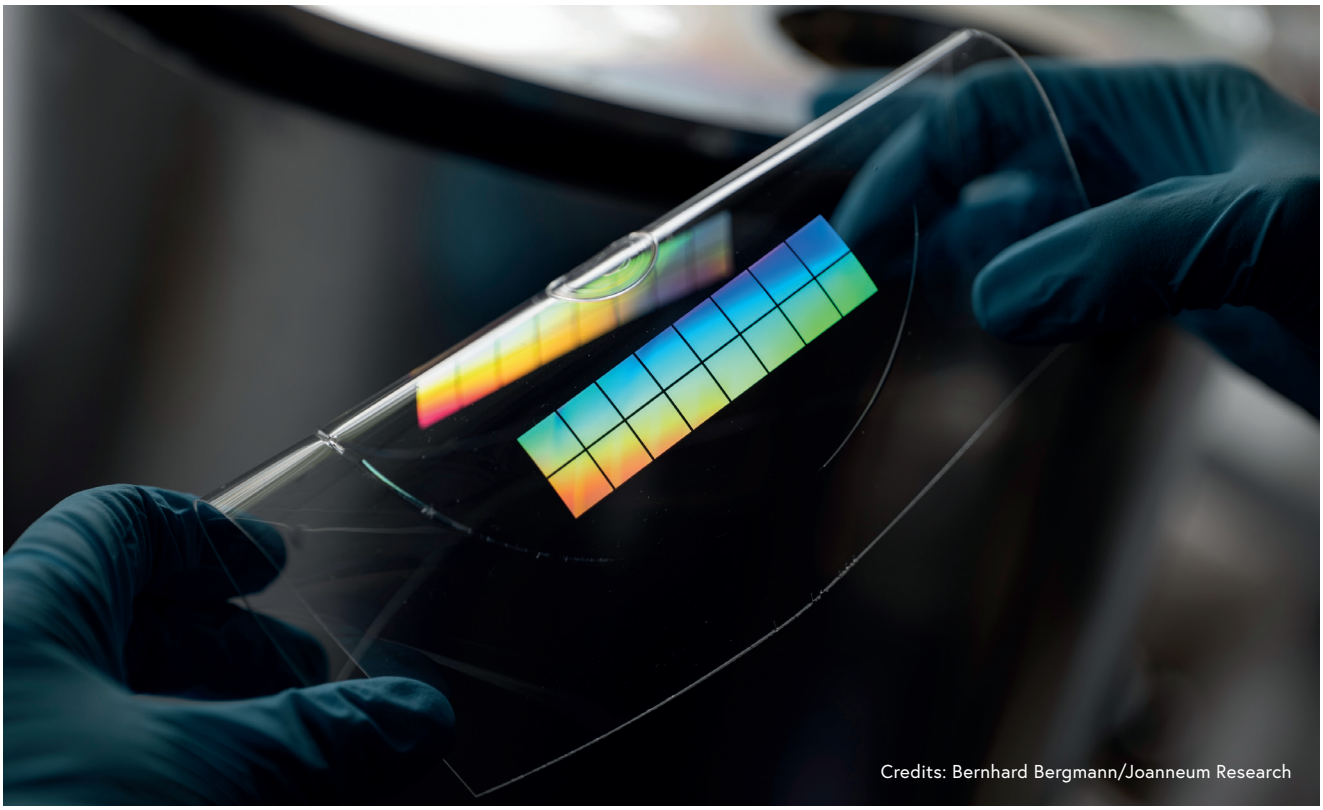
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4 Fields of action for strategic objectives

In order to achieve the strategic goals of defence research, six fields of action are defined in which individual measures for the respective targeted implementation of the strategy are specified. However, the targeted measures of the defence research strategy do not start from scratch. The MOD/AAF already have successful processes, broad expertise and qualified personnel as well as valuable partnerships in the individual fields of action, which serve as a solid foundation for future research. The current status quo is briefly presented in the individual fields of action. The development potential identified is shown in the individual measures in the fields of action.

4.1 Field of action: Strategic research and development areas incl. R&D centres of gravity for national and international research-led capability development

4.1.1 Status

In an international comparison[3], the 14 main research fields of the MOD/AAF are too many. This leads to a sometimes strong fragmentation of the individual areas and makes interdisciplinary exchange more difficult. In addition, there are sometimes significant overlaps in terms of content.

4.1.2 Planned measures for the strategic field of action

Research-relevant support for the topic-based implementation of the Zielbild 2032: The fundamental thematic focus of defence research in the implementation of the Zielbild 2032 is to support capability development with regard to increasing combat power, responsiveness, command superiority and resilience. The resulting research requirements for the Austrian Armed Forces 2032+ must be explicitly assessed and the research requirements identified must be submitted to the Directors' Conference by the directorates.

Streamlining the current portfolio of thematic priorities to seven areas: Based on the countries analysed in a study[4], the currently existing 14 thematic fields will be merged to seven Strategic Research and Development Areas (SRDA). The thematic priorities will be bundled in these areas. The new SRDAs will already be applied as part of the 2024 research process, meaning that the SRDAs will be reflected for the first time in the 2025 defence research programme. An evaluation of the SRDAs is to be carried out for the first time as part of the 2028 research process.

[3] For example, the Swedish Defence Research Institute (FOI) and the Netherlands Organisation for Applied Scientific Research (TNO) each have only four, the Finnish Defence Research Agency (FDRA) from Finland has five and armasuisse from Switzerland currently has seven subject areas.

[4] A study by JOANNEUM RESEARCH and the AIT Austrian Institute of Technology in co-operation with Federal Ministry of Defence.

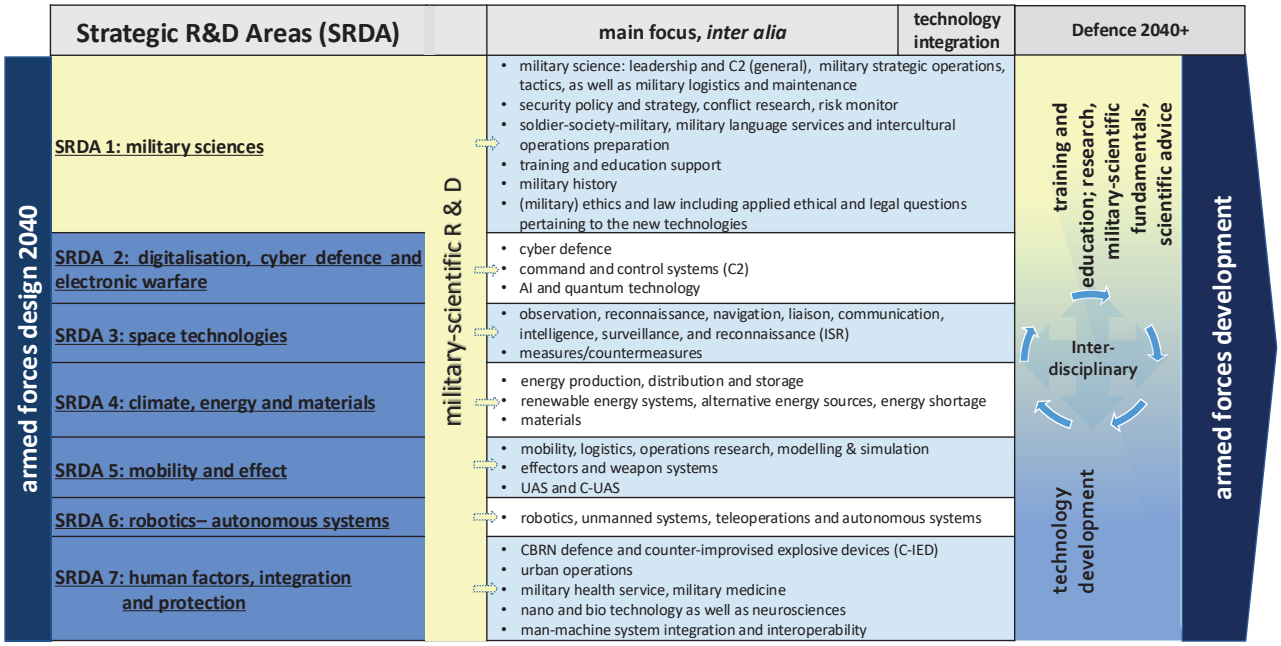


Figure 2: Seven Strategic Research and Development Areas

Understand SRDA descriptions as a „living document“: Since the SRDA descriptions are fundamentally understood as a „living document“, it is possible to adapt the description and edit the content of the individual SRDAs as part of the annual research process. The following brief description provides an initial insight into the SRDAs.

- **SRDA 1 –“Military Sciences“:**

  The „military sciences“ in general and „military science“ in particular play a decisive role in the future development of the MOD/AAF and support the permanent adaptation and transformation of the AAF. SRDA 1 contributes to ensuring that the Armed Forces remain adaptable through research and development and can dynamically adapt to the constantly changing scientific, technological, geopolitical and military challenges. Research in SRDA 1 ensures that its core area in particular, „military science“, is continuously developed and that the scientifically generated findings from the other SRDAs are incorporated into capability development and research-led teaching. The accompanying research ensures that the results of the technical SRDAs are carefully analysed and prepared for teaching, so that they make a positive contribution to improving military practice and promoting the safety of soldiers.

  Security policy and strategy also have a central position in SRDA 1. The complexity of security policy and strategy development in connection with conflict research requires an ongoing examination of the regions, organisations and conflict constellations relevant to the MOD/AAF in order to anticipate future risks and threat scenarios and thus

be able to provide well-founded policy advice. The research focus is on investigating the effects of new technologies and methods of conflict resolution and, based on this, the further development of the individual sub-areas, taking into account the effects of innovations in the other subject areas of SRDA 1 and the other SRDAs. These are supplemented by military linguistics and intercultural mission preparation.

- **SRDA 2 –"Digitalisation, Cyber Defence and Electronic Warfare":**
  The development of information and communication technologies and the associated digitalisation as well as emergent technology developments with regard to future key technologies such as artificial intelligence (AI) or quantum technologies are of central importance for modern armed forces. Operational scenarios such as cyber operations, electronic warfare (EW) or hybrid conflicts have an impact on the development lines (training, infrastructure, equipment, personnel, etc.) of capability development and therefore affect the overall organisation of the MOD/AAF.

  Military tasks with the overarching goal of ensuring the AAF's C2 capability, and guaranteeing this in the overall national context, require particularly robust information and communication technology solutions (ICT solutions). These must also be available in a challenging environment and ensure up-to-date capabilities for the protection of its own systems as well as external systems of strategic importance to the AAF and the Republic of Austria.

  SRDA 2 concerns one of the most important core military capabilities: command and control. The establishment of interoperability and the self-determined, resilient use of information and communication technology need a high level of knowledge that can only be achieved to the quality called for through active innovation and participation in research projects.

- **SRDA 3 – "Space Technologies"**
  For armed forces, the constant new and further development of technologies and applications in the field of space and the associated new threat scenarios represent both an emerging, growing challenge and an indispensable military benefit. Internationally, many countries, including Austria, have already taken this development into account and defined the area of space technologies or „space" as a separate domain. Austria wants to act as a responsible space player in the future and, based on the new Austrian Military Space Strategy 2035+ (ÖMWS 2035+) and the report on the structural anchoring of the space domain, wants to make a paradigm shift from a pure user to an operator and provider of space infrastructures and services.

For the strategic research and development area of „space technologies“, this creates a comprehensive spectrum for the development of potential new military capabilities.

- **SRDA 4 – “Climate, Energy and Materials“**
  The strategic importance of climate, energy and materials research for the military is often underestimated. Climate research helps to understand the effects of climate change on military operations and infrastructures, which is essential for planning and adapting defence strategies. The AAF have to make appropriate deductions from the changing environmental conditions and also adapt national defence to upcoming or emerging changes in the climate.

  The development of new materials and research into new applications and possibilities for known materials play a key role in the production of advanced, lighter, more resistant and more durable military equipment, vehicles and structures that are also simple and low-maintenance. These areas of research are therefore critical to ensuring the effectiveness, efficiency and adaptability of military capabilities in a rapidly changing world.

- **SRDA 5 – “Mobility and Impact“**
  Mobility enables troops to move quickly and efficiently, which is crucial for conducting operations and responding to threats. Greater mobility leads to improved strategic flexibility and operational efficiency. The effectiveness of the impact of weapon systems is an essential factor in achieving desired military objectives. Effective weapon systems can be decisive in deterring opponents or gaining superiority in the event of conflict. Linked to mobility and effectiveness is the protection of personnel and equipment in order to maintain the combat readiness of the armed forces and minimise losses. Even with a transformation towards energy-efficient digital systems with a high degree of autonomy, these elements of military success remain, but must be rethought in the context of current conflicts and their highly visible innovations. Research into new technological developments in the field of AI, robotics and autonomous systems provides a fundamental basis for a new concept of modern armed forces.

- **SRDA 6 – “Robotics – Autonomous Systems“**
  The transformation of the military from personnel-intensive hardware-related defence capabilities with large and complex weapon systems to a software-related defence capability with many cost-effective small autonomous weapon systems is a worldwide phenomenon that affects both producers and users. This digital revolution is irreversible and introduces cost accounting and automated means of production into the realm of military competitiveness. Findings from the field of „robotics and autonomous systems“ provide fundamental processing bases for the conception of armed forces of the present and the future. Unmanned and „autonomous systems“ represent a

massive multiplier for the fulfilment of the mission on the battlefield of the future. For military applications, in addition to autonomous driving, the focus is on the use of „autonomous systems“ on the battlefield without infrastructure, deliberate acceptance of system losses (expendable system), interaction (human-machine teaming) and driving in columns in accordance with military requirements. Furthermore, robotic (additive) manufacturing processes can be used to produce components of appropriate strength and precision on site, thereby also changing the logistics of spare parts.

SRDA 6 focuses mainly on the accompanying research and development of intelligent, autonomously acting machines. This includes the creation of „autonomous systems“ and robots capable of performing tasks in various military related environments, from industry to military assistance. A current and key topic is the integration of AI to equip machines with advanced learning capabilities and adaptive algorithms. This also includes the development of advanced sensor and navigation systems that enable „autonomous systems“ to precisely perceive their environment and interact with it accordingly. Safety and ethical considerations also play a central role, particularly with regard to the interaction of these systems with humans and their influence on decisions on the battlefield.

- **SRDA 7 – “Human Factors, Integration and Protection“**
  The strategic research and development area „Human Factors, Integration and Protection“ (SRDA 7) is of great importance for the future performance of the Austrian Armed Forces, as it focuses on soldiers, their integration and their protection. This also includes understanding and improving the interactions between soldiers and the technology, equipment and systems they use. The focus is particularly on the interfaces between humans and machines, physical and cognitive performance in special deployment scenarios and the stress requirements specific to the military. Current developments show a path towards the decentralisation of military capabilities with a simultaneous increase in networking and concerted operations. This places greater demands on the individual and requires support in minimising stress, decision-making and the ability to react and adapt.

  The general monitoring and development of the health of national service personnel, trainee service personnel, and women in the trainee service as well as all measures to promote potential and reduce limitations with regard to the expected requirements necessary to fulfil the operational tasks of the future are also part of this SRDA. The area “protection” is an integral part of mobility, endurance and resilience and also begins with the individual soldier.

  In addition, SRDA 7 contributes to facilitating the integration of new technologies and systems into military practice. By understanding human factors, especially in the

context of new AI-supported weapon systems and digitalisation, the development of equipment and technologies can be designed to match the natural capabilities, limitations and needs of soldiers, which in turn increases the effectiveness and operational readiness of military forces. Research in this area enables and supports the achievement of greater overall efficiency and effectiveness of military operations by ensuring that the human aspects are considered and optimised in all phases of the planning, development and execution of military operations.

Strengthen interdisciplinarity in the seven SRDAs in defence research: The existing and future challenges in the field of defence research make an interdisciplinary approach necessary. This must combine interdisciplinary technical and scientific approaches as well as approaches from the military sciences (including military science on the one hand and the military-relevant branches of science, e.g. law, social sciences and human sciences, on the other). This interdisciplinary approach is to be applied in all areas of defence research. In addition, the streamlining of the strategic R&D areas and the research management groups based on them will also strengthen interdisciplinarity within the MOD/AAF.

Co-designing the thematic focus of research within the framework of a MOD Directors' Conference: In future, the directors of the MOD will submit proposals for the content of research activities within the strategic R&D areas on an annual basis. The conference is preceded by an internal survey process within the respective directorates. This ensures the necessary commitment to defence research at management level and it also ensures that the medium to long-term planning dimension is taken into account. Thematic priorities are derived, in close coordination with the Capabilities & Policy Planning Directorate, from the findings of „Technology Foresight" in conjunction with the necessary competence development derived from this. Subsequently, the period under review will be extended beyond the 2032 development plan or Zielbild 2032 to the 2040+ horizon. In order to maintain this long-term perspective on technological developments relevant to the development of the armed forces, a „Technology Foresight Process" (TFP) is to be set up and established. This TFP will serve to set objectives and prioritise research and development priorities for national and international funding programmes and provide input for this strategy.

Promotion of a positive culture of innovation: Suitable methods for promoting a positive culture of innovation within the MOD/AAF (openness to new ideas) are to be identified, empirically analysed, evaluated and implemented depending on the results via an internal departmental study as part of a yet to be ordered research project.

4.2 Field of action: Research process, structures, documents, actors and their roles

4.2.1 Status

The already successfully established research process in the MOD/AAF comprises a total of seven phases and is clearly defined. In line with the central process of national defence policy, this has resulted in a well-established and proven system of research planning in the MOD/AAF via the condensed sub-process 6 (research process).

Top-down topics are defined annually within the strategic R&D areas and bottom-up topics for research projects are collected with the involvement of all relevant departments and stakeholders. The research projects are then thematically structured, coordinated and integrated into an annual R&D programme.

To ensure successful research work, the research steering authority of the MOD maintains continuous contact with internal users and various external R&D innovation networks.

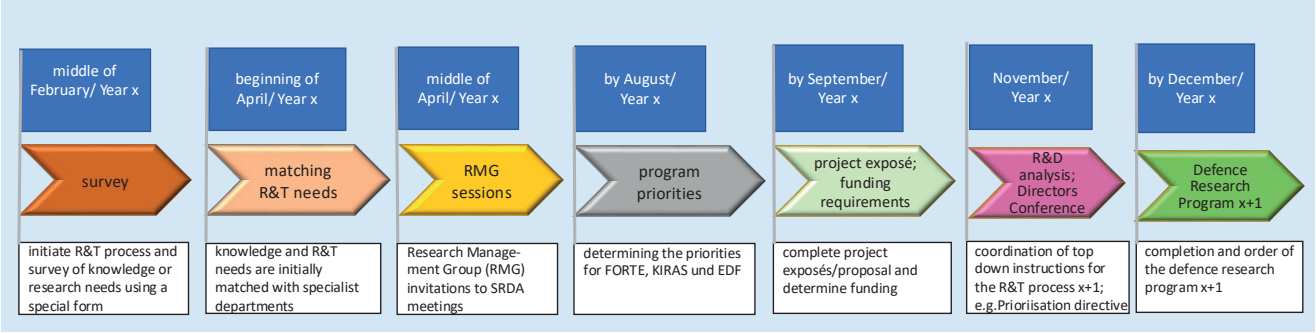


Figure 3: The research process in the annual cycle

4.2.2 Planned measures for the strategic field of action

Better dovetail research planning with other planning processes: The research process must remain flexible in order to be able to react quickly to new, short-term requirements. At the same time, however, there should also be a stronger focus on the long-term perspective of R&D (defence research 2040+) in the future. This should, among other things, enable a more sustainable and predictable strategic positioning in the national and European context. To this end, R&D-relevant inputs must be incorporated into the strategic guidelines in a forward-looking manner (e.g. prioritisation directive). Close dovetailing with the central processes of national defence – in particular via an annual directors' conference – must be ensured. The results of the conference subsequently serve as top-down guidelines for the directive to initiate the research process for the coming year.

Strengthening the potential for testing and evaluation and involving the troops in these activities at an early stage: An expansion of the standardised embedding of R&D activities in structures of the Austrian Armed Forces, in particular the involvement of the troops for further R&D-relevant tests and technology evaluations, is of increasing importance. The potential for testing and evaluations in the area of defence research should therefore be expanded in the sense of lab-to-battlefield innovation. The AAF's resource potential should be better utilised through earlier planning. To this end, the intended deployment of the troops for tests, evaluation and trials must be planned two years in advance, submitted to the Directors' Conference and announced for the annual planning within the framework of the central processes of national defence.

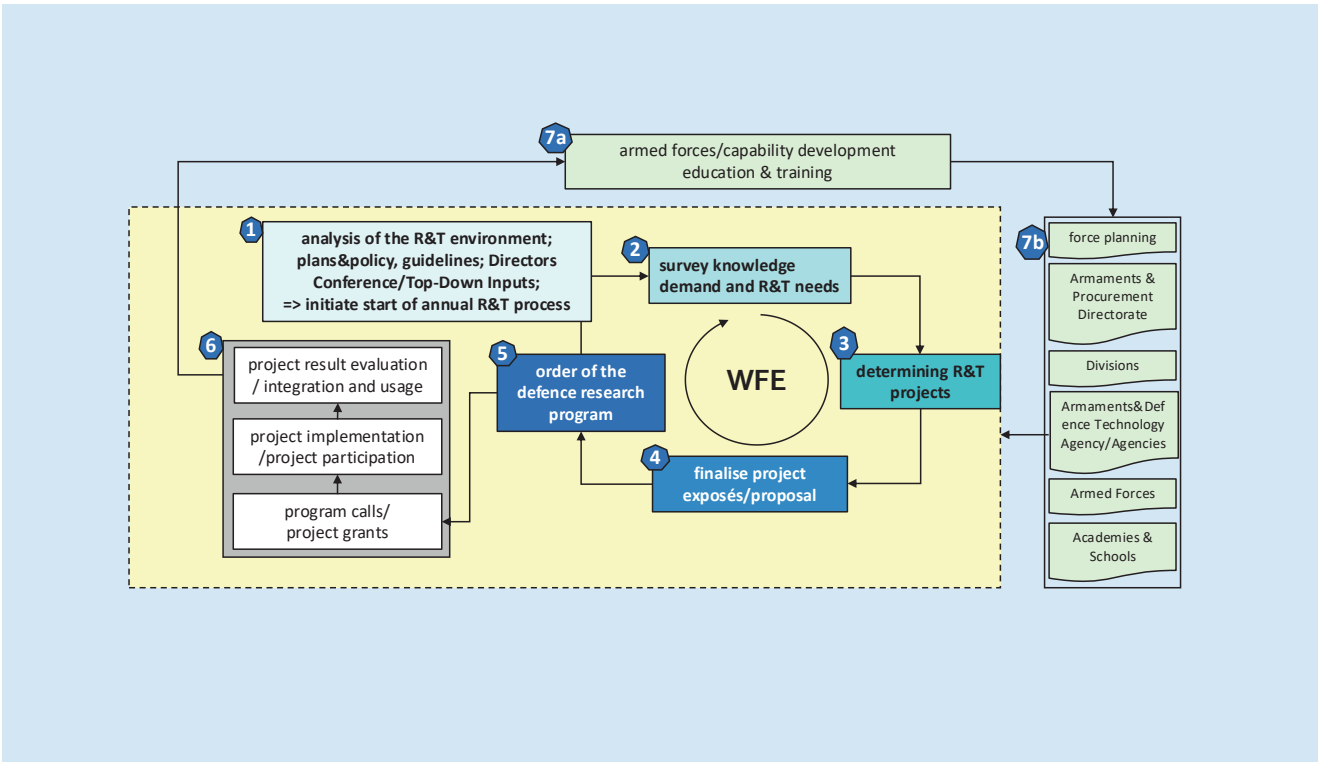


Figure 4: Procedure and integration into the research process of the MOD

Closer coordination of R&D planning with long-term procurement planning: A significant increase in the use of research funding programmes, the digital transformation in the department and an increasing number of R&D-relevant committees require an adaptation of the already well-established R&D process and a close cooperation between R&D, planning and procurement. In the future, the strategic orientation of defence research activities should therefore be coordinated with long-term procurement planning on the basis of identified capability requirements wherever possible. This periodic coordination with the central processes of national defence and the associated communication structures should, in addition to the Capability Board, be further promoted between the departments concerned, e.g. in the form of the Directors' Conference.

Utilisation of R&D as a procurement input: In cooperation with the relevant departments, prototypes and demonstrators created as part of R&D projects should be used as knowledge input for any future procurement processes. To this end, procurements that are required for the implementation of R&D projects or for the further testing of R&D results should be obtainable by the defence research budget authority or commissioned by it. These R&D procurements serve to gain knowledge quickly and unbureaucratically

and, if they cannot reasonably be transferred to a regular system life cycle, are either to be kept available for further R&D testing by the user without bureaucracy or to be cancelled or written off. The Directors' Conference should assume an important exchange, coordination and decision-making function here.

Implementation of an internal departmental monitoring and evaluation system for defence research (Research Information System/ReIS): Building on experience with civilian research programmes, an evaluation and monitoring system based on impact pathways will be established. This will link the productive interactions of the activities carried out in the research programme with identifiable effects on the Austrian Armed Forces, the economy and society in a broader sense. This evaluation and monitoring system will be integrated into a digital research management system (ReIS).

Transparent document access via ReIS: In order to make the research process more accessible and effective for all participants, greater emphasis will be placed in the future on transparency, knowledge transfer and the implementation of research results. The research management system will take important steps towards digitalisation in the coming years. The ReIS project, which has already been initiated, will represent an important milestone in this area.

Analysis of existing research-relevant structures, capacities and their actual utilisation: In the departments of the MOD/AAF, the jobs should be systematically recorded with their proportionate R&D relevance. In this way, a structured overview of the available internal capacities for defence research can be created. This measure could, if necessary, be assigned internally as a master's thesis, split according to specialist areas or departments.

Percentage adjustment of the research budget to the national defence budget: Expenditure on defence research is necessary to ensure superiority in potential conflicts. Expenditure on defence research should develop in proportion to the planned increase in overall defence investment. This way, the current level of research expenditure of comparable countries can be achieved, at least in the medium term. The broad range of topics already covered by the MOD's R&D[5] favours the expected success of the increased use of funds, as it is significantly faster and more effective to ramp up existing research activities of a smaller scale than to start them from scratch. The long-term goal is to link the R&D budget to 2% of the defence budget. In this context, it must also be noted that the knowledge requirements of armed forces are largely independent of their number of personnel and essentially depend on the ambition, including the potential operational areas, the respective actively perceived domains and the associated systems. Conversely, this means that even relatively small armies have a similarly high knowledge requirement or a comparably high need for R&D knowledge gain as much larger armies. This means that there is also a similar need for human and financial resources.

Increase the budget for contract research at the MOD: Contract research projects are highly flexible in terms of their content. However, their annually available funds are too small to provide the necessary impetus. Furthermore, although it can be assumed that the funds made available for funded research projects (FORTE and KIRAS) by the Federal Ministry of Finance (BMF) as their programme owner will be available on a continuous basis, this cannot be regarded as reliably secured in the medium term. In order to achieve better medium-term planning security and to be able to support long-term, needs-based capability development of the Austrian Armed Forces, the budget for MOD-financed contract research should be increased in relation to research funding in the future.

Percentage splitting of the R&D budget to stimulate innovative implementation of R&D results: High potential is identified in the utilisation and implementation of R&D results. Targeted promotion/follow-up of innovative implementation options for new technologies, generated from the results of R&D projects in which the MOD has participated, makes sense and should be initiated and supported as part of the process. A percentage split of the R&D budget could contribute to stimulating a targeted innovation process over an initial 5-year observation period. The recommended ratio is a split of the R&D budget into 30% for research projects, 50% for development projects and 20% for innovative implementation projects of R&D results. This means that approx. 20% of the regular research budget should be defined as specific innovation capital. This should be allocated or used quickly, flexibly and unbureaucratically (also outside the research programme) by the research steering authority of the MOD for innovative

[5] Funding programme for security research

new developments, test procurements and special test procedures for R&D results. It should have a certain innovation risk tolerance, as in retrospect, some innovation efforts may turn out to be unsuccessful. In any case, it should be permissible to defer funding if the innovation capital cannot be fully utilised in the annual tranches. After five years, this measure should be evaluated for practicability and impact (increased realisation of R&D results).

Clearly define defence research players and their roles: In addition to specially designated R&D specialists (researchers/developers), the work profiles of those experts who are involved in the development and technical support of research projects should be clearly defined and therefore reflected as a percentage in the job descriptions. In the medium term, all jobs with R&D relevance should be accessible in ReIS via an interface (department and job description; additional cockpit features for R&D) and should also be analysable for R&D statistics. A reduction in routine activities could lead to a reduction in the experts' workload.

Continuous provision of research formats with clearly defined persons/deputies: At present, structural deficits are making work more difficult, as a lack of personnel capacity means that the necessary contact points/committees cannot be staffed/served, especially at European level. Corresponding capacities with clearly defined persons and deputies must be created in the various organisational units.

Expand the functionality of the established research coordination centre: Within an already established research coordination centre, which is regularly involved in sensitive R&D projects, a specially designed supplementary test and integration laboratory should be set up as an important element for the targeted implementation of research results and capability development. Where necessary, this laboratory should also be able to cooperate with non-university and university research institutions as well as industry and be able to extensively test the results of security-relevant R&D projects in a protected environment for their secure applicability.

4.3 Field of action: Human resources

4.3.1 Status

The MOD/AAF already benefits from experienced and recognised employees who are active in various phases and activities within the defence research process. However, there are insufficient personnel capacities available to intensify defence research in the future. This applies both to the respective directorates/departments as project users and to the research steering authority of the MOD.

The competition between the MOD/AAF and the civilian labour market for qualified personnel makes recruiting more difficult and more expensive. Particularly in highly specialised professions (e.g. doctors, technicians, pilots, etc.), it is becoming apparent that it is no longer possible to recruit the necessary personnel with the existing conditions pertaining to service, contract and salaries. Innovative approaches to personnel management are required in order for the MOD/AAF to remain successful in recruiting personnel for the areas relevant to defence research in the medium to long term.

There are already clear personnel bottlenecks with regard to the representation of interests in international committees and working groups, e.g. in the Capability Technology Areas of the European Defence Agency (EDA CapTechs). If defence research is expanded in line with the strategy, this personnel bottleneck will be exacerbated to the point where key parts of the strategy cannot be implemented.

4.3.2 Planned measures for the strategic field of action

Create additional personnel capacity for the management of defence research at the users' level and in the research steering authority of the MOD: The urgent need for additional personnel capacities concerns both the respective directorates/ departments as users and contributors to the respective R&D projects and the research steering authority of the MOD as the coordinating unit. On the one hand, personnel with technical or scientific expertise are required, and on the other, personnel with project management, knowledge management and (innovation) network support skills. A position should be created at each of the directorates, as the respective direct R&D demander, which can act as an operational contact point – at least a point of contact (POC) and a deputy POC – for the research steering authority of the MOD. This position should be assigned directly to the directorate as a staff unit. At least three new jobs should be created at the research steering authority of the MOD. The tasks of these positions are to oversee long-term research planning in the identified future fields, to ensure the interfaces to capability and armaments planning as well as quality management, results implementation tracking, research marketing, and communication and public relations work.

Attracting and retaining new experts: As experience in knowledge-intensive organisations shows, attractive framework conditions that can be communicated to the outside world are crucial for attracting and retaining experts in the long term. This is also important because it takes an average of 5-7 years to build up specialist expertise in a particular field. Therefore, target group-specific communication of existing, attractive offers and their framework conditions should be established and interim solutions to cover short-term demand should be considered. The length of time spent in an R&D-relevant job could also be increased through additional measures to make it more attractive (e.g. retention bonus) in order to prevent migration to better paid jobs.

Competitive salaries for certain R&D specialisms: Furthermore, for certain specialised areas, for example in the information technology (IT) sector, competitive salaries outside the salary scheme as well as their training must be adjusted in order to attract and train innovative, capable and creative personnel.

Make use of the Recruitment initiative "Mission Vorwärts" to target specialists in the field of defence research: As part of „Mission Vorwärts" ("Mission Forward"), the Austrian Armed Forces began an intensive recruitment campaign. In the future, these activities should also be used to address potential specialists for defence research. The emerging simplifications through the elimination of bureaucratic hurdles envisaged in the

implementation of the “Zielbild 2032”must be fully exploited in all personnel measures in connection with the defence research strategy.

Continue to actively utilise the administrative internship as an instrument for the targeted search for talent: The instrument for twelve months of preparatory training (= administrative internship) with the aim of subsequent employment in the federal service should be used specifically in the future to recruit potential talent in the field of defence research. For those who prove themselves during these twelve months but cannot be taken on immediately for organisational reasons, it should be possible to bridge the gap via a pool of project jobs until a slot in the MOD opens up. It is important that this bridging period can be organised as unbureaucratically as possible and that the people concerned are offered attractive working conditions.

Systematise and intensify cooperation with universities and universities of applied sciences: There are already a number of personal contacts with universities and universities of applied sciences at directorate level, for example in the context of teaching assignments. At the same time, the Science Commission at the MOD, for example, offers direct access to the highest levels of academia in Austria. These contacts and access points should be systematically recorded in the future and actively utilised structurally for long-term personnel recruitment. Cooperation with universities and universities of applied sciences should generally be expanded further and a reciprocal project-related researcher exchange mechanism should be considered. In addition, the supervision/ support of scientific activities (i.e. Bachelor‘s and Master‘s theses, project work, etc.) must be intensified. This will enable future graduates to familiarise themselves with the experts and employment opportunities at the MOD at an early stage. In this context, the aim is also to ensure that organisational elements of the Austrian Armed Forces that carry out research are given the opportunity to obtain this status so that they can make use of additional national funding mechanisms (e.g. CD laboratory).

Establish a project labour pool for participation in specific R&D projects: External personnel capacities should be better utilised in the MOD/AAF for defence research by establishing a project-related job pool. This pool represents a flexible instrument, limited in time, to integrate personnel from universities and universities of applied sciences who are not seeking permanent employment in the federal civil service, and it should be organised in cooperation with relevant institutions from this sector.

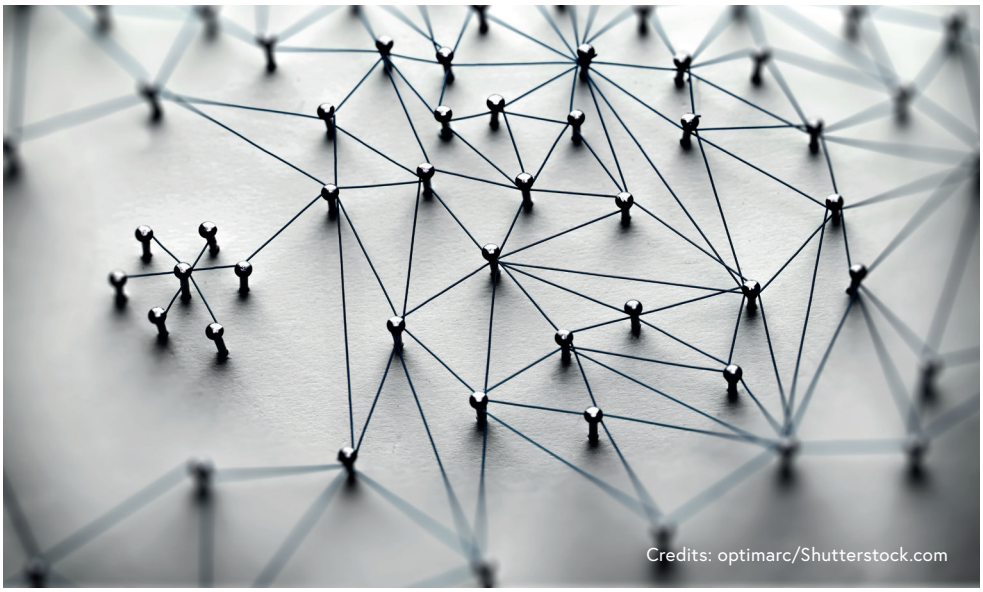
Ministry specific “R&D personnel model“ with attractive special contracts: Creation of an R&D personnel model that is flexible and does not require extensive administration. Short-term contracts of up to 2 years „off the peg“, without the need to involve the Federal Ministry of Arts, Culture, Civil Service and Sport, should be the aim here. It may also

be possible to create a close alliance with the research-relevant ministries in accordance with the Federal Ministries Act and develop an interministerial R&D personnel model.

Increasing the occupancy rate of unfilled R&D-relevant jobs: In the short term, until new R&D jobs are created, increased efforts could be made to fill currently unfilled R&D-relevant jobs. This could bring quick and uncomplicated improvements to identified bottlenecks.

Strategically develop gender equality in defence research: Diversity and integration should also be specifically addressed in the area of defence research. In regulatory and legal terms, the Federal Civil Service already has good conditions for equality, e.g. through fixed and transparent salary schemes. In the area of defence research in particular, efforts should be made to attract more women to work in this field. In addition, the most effective approaches in the armed forces of other countries should be identified on the basis of good practice analyses and checked for their transferability to Austria.

4.4 Field of action: Cooperation and collaboration (national and international)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4.4.1 Status

Austrian defence research builds on the existing strengths of the national scientific and defence industry base. Accordingly, external research institutions and industry are essential partners of the MOD/AAF in the research process. The open system of defence

research initiated by the MOD for Austria has proven its worth and well-developed cores for national innovation systems in the individual technology areas – in digitalisation and cyber, in CBRN defence and in Counter-Improvised Explosive Devices (C-IED) – have already been created through project activities. Important core players, both in the research and business sectors, are active in various technology areas and link them. Expenditure on defence research also supports growth and employment in Austria as a business location. At the same time, defence research in Austria creates synergy effects with the civilian sector on the basis of dual-use applications.

The MOD/AAF has great potential in Austria with regard to the testing and evaluation of defence and dual-use technologies and even has a unique selling point in specific areas. This applies both to the corresponding infrastructures and to the troops as a test and evaluation centre.

At interministerial level, the MOD has established itself as a partner in the national RTI community in recent years and works successfully with other ministries, particularly in the FORTE and KIRAS programmes. It also represents defence research interests in the Austrian Space Applications Programme (a technology programme with dual-use potential). Furthermore, through the national coordination of the EDF, the MOD was able to establish the programme successfully at the national level.

In addition to this, European cooperation plays an increasingly important role in defence research. In recent years, the MOD has successfully established networking on several levels. This reduces costs and risks and promotes interoperability and common standards. In addition, the exchange brings new knowledge to the MOD/AAF and the national defence industry. Within the MOD, established management processes are in place for international cooperation and an extensive support network can be utilised, e.g. the Austrian Federal Economic Chamber, the Austrian Research Promotion Agency, the EDF Advisory Board, formats within the framework of the Germany-Austria-Switzerland region (Deutschland-Austria-Confoederatio Helvetica i.e. DACH region). In addition, there are established global networks with civilian and military scientific institutions (e.g. United States Military Academy at West Point, Ecoles de Saint Cyr Coëtquidan, Royal Military Academy in Brussels, the PfP Consortium of Defence Academies and Security Studies Institutes or the International Society of Military Sciences).

Available personnel capacities are the most important means for a rapid and low-threshold expansion of fruitful cooperation – be it national or international. For this reason, the available human resources must always be taken into account in all proposed measures.

4.4.2 Planned measures for the strategic field of action

Continue and further develop the open system for defence research: In addition to the MOD's internal R&D project implementation, defence research should also be conducted with adequate external partners in the future. Intensive involvement of the users, i.e. the future end users in the Austrian Armed Forces, should be sought in any case. On the one hand, this means that cooperation with external R&D centres should be expanded. On the other hand, there are also plans to develop new innovation systems relevant to defence research in areas such as quantum technology and AI and, where necessary, to add new cooperation partners.

Cooperation institutes in accordance with the cooperation programme partially cover short and medium-term knowledge and research requirements through application-oriented contract research and the organisation of topic-related events. The existing contracts with these institutes should allow flexibility in the implementation of the corresponding work programmes and, if necessary, be supplemented by demand-oriented contracts during the year.

International institutions such as the EU ISS (Institute for Security Studies), ECFR (European Council on Foreign Relations), Hybrid Centre of Excellence, JRC (Joint Research Centre), UNIDIR (Institute for Disarmament Research) and other bilateral and multilateral organisations (e.g. NATO Cooperative Cyber Defence Centre of Excellence) should be prioritised via direct awards for individual projects to cover short to medium-term requirements.

Helping to shape the national RTI landscape and orientation: Although defence research is already better anchored at the national RTI governance level than it was a decade ago, there is still recognisable potential for improvement, especially in the national perception of defence research as an equally important research area in the national RTI system. The aim is therefore to ensure that defence research is also included in national strategy documents outside the area of security and defence by participating in the creation of strategic basic documents and legislative amendments. In addition, other ministries and complementary policy areas should be able to be more aware of defence research in the future through periodic networking meetings. Both points can be ensured through network development and communication work. Such networks with defined POCs should therefore be established and suitable communication formats set up with other ministries.

Interface and coordination with the government programme: The 2020-2024 government programme points out the need for new capabilities of the Austrian Armed Forces regarding current threat situations (such as hybrid threats) and explicitly refers

to the need for defence research, especially in the European context. Further R&D-relevant specialist inputs for the positioning of defence research must be prepared for government programmes in the coming legislative periods and positioned accordingly.

Actively develop dual-use potential in other national thematic programmes: As already outlined, the MOD/AAF has great potential in Austria with regard to the testing and evaluation of dual-use technologies and even has a unique selling point in specific areas. While close coordination with the Austrian Space Applications Programme (ASAP) has already been successfully established, other thematic programmes of the federal government should also be examined for their dual-use potential. These are: Austrian Life Sciences Programme, Digital Key Technologies, ENIN – Emission-free Commercial Vehicles and Infrastructure, Artificial Intelligence Mission Austria (AIM AT) funding initiative, NANO Environment Health and Safety, and Quantum Austria, Quantum Research and Technology. In the case of a dual-use perspective, coordination should then take place analogue to the procedure for the ASAP.

Establish defence research as a win-win situation for the Austrian Armed Forces and industry: Together with the Federal Ministry of Labour and Economy (BMAW), the development of an Austrian defence technology cluster modelled on the Croatian defence cluster (i.e. professional cluster management, strong focus on cooperation in research and innovation) should be initiated by the national economy/industry. The national defence industry strategy, which is currently being developed, and its mechanisms should be used as an anchor for implementation.

Make defence research a national task within the framework of comprehensive national defence: In addition to military national defence, defence research should also encompass the areas of intellectual, civil and economic national defence. Accordingly, the relevant ministries (i.e. BMF, BMBWF, BMI, BMK, BMAW, BMJ) should come together in a working group to develop a joint research agenda. Existing structures should be utilised here. Implementation could then take place, for example, within the framework of KIRAS or through direct commissions from the ministries involved. As an extension of the existing security bracket (in particular KIRAS and FORTE), further convergent political, military and social interests and objectives of comprehensive national defence could be structured, identified and jointly processed in R&D projects after jointly agreed objectives have been set (every two years).

Actively continue the successful collaboration with Germany and Switzerland (DACH Region): Both due to the linguistic and cultural proximity, as well as on the basis of the existing common focal points, the research-relevant cooperation in the DACH region should be actively continued. The identified future topics are already well addressed in the DACH region in both the civilian and dual-use sectors, meaning that further and

more in-depth cooperation in terms of content makes strategic sense. Furthermore, new partners should be addressed in addition to existing closer intergovernmental co-operation. In addition to Finland, the Netherlands could be a thematically interesting partner. The focus areas of the Dutch TNO offer useful points of contact here. These are „Operations and Human Factors“, „Information“ and „Sensor Systems“.

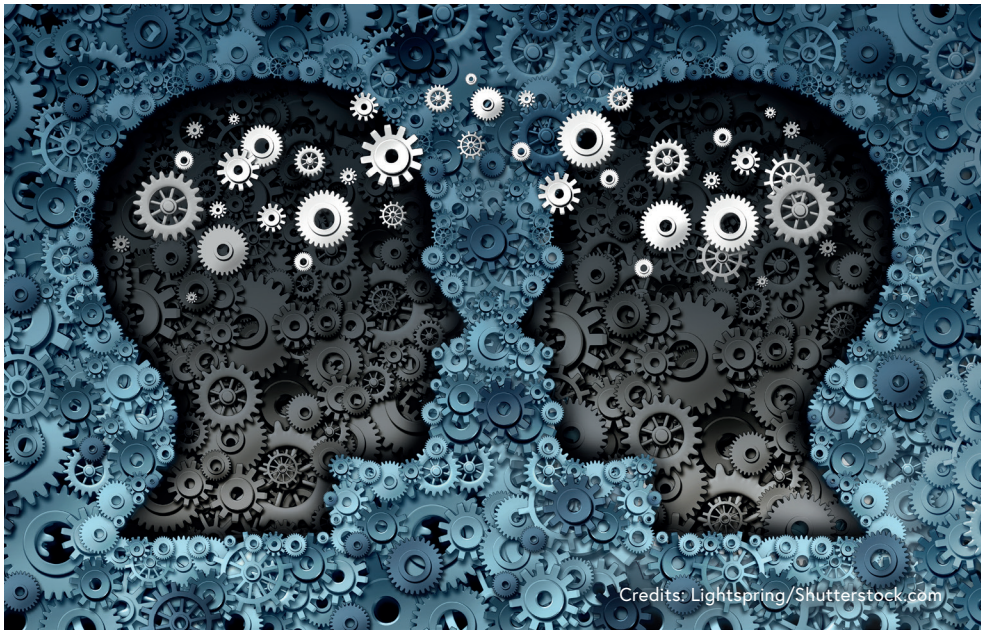
Use the EU Space Strategy for Security and Defence as a window of opportunity for thematic cooperation at EU level: As the domain of space in Austria has proven technological strengths, critical masses and a very high dual-use potential, especially when measured against the size of the national innovation system, efforts should be made to position Austria in this field of strength at EU level and to network with other partners, complementing the implementation of the Austrian Military Space Strategy 2035+ (AMSS 2035+).

Using IPCEI to bridge the „valley of death“: One example of support possibilities through other EU programmes is Important Projects of Common European Interest (IPCEI). The European Union has developed this instrument to strengthen strategic European value chains as a special regulatory instrument that enables the promotion of transnational cooperation and the mapping of the value chain from applied research, development and innovation to initial industrial realisation. The aim is to overcome the so-called „valley of death“ between research and procurement. In close coordination with the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) and the BMAW, a national initiative with the defence industry base (the official initial impetus for this should come from a major company) for the establishment of an IPCEI for defence technologies should be launched and coordinated with other EU member states. From Austria‘s perspective, the establishment of an IPCEI on the topic of space would be particularly useful and promising.

Docking onto platforms and networks outside the EU framework: Networks are also developing outside the activities of the European Union in the area of defence research that deal with topics of interest to the MOD/AAF, for example Defence Innovation Accelerator for the North Atlantic (DIANA) and Joint European Disruptive Initiative (JEDI). It makes sense and is necessary to sound out opportunities for cooperation and, if necessary, to test them. In principle, a pragmatic and flexible approach to international cooperation should be pursued, whereby the experience gained from working in the NATO Science and Technology Organisation (STO) must be brought to bear. However, R&D cooperation at EU level or with EU nations is generally prioritised.

Assess cooperation with third countries strategically: Partnerships, especially with third countries, should be strategically considered and focus on the areas that promise the greatest impact and are in line with current government programmes.

4.5 Field of action: Knowledge management – securing, distributing, implementing and utilising R&D results



4.5.1 Status

New knowledge gained through defence research is not yet easily and centrally accessible for all relevant actors in the MOD/AAF. This applies both to information on the projects themselves and on the R&D results. This fragmentation of research-relevant knowledge represents a significant barrier to innovation. Existing knowledge cannot be incorporated into new project ideas and new knowledge from different projects cannot be synergistically combined with it. Against this background, the development and maintenance of a centralised digital management system, through which a large number of documents, reports, data and best practices can be accessed, is an important step. This system will significantly improve the planning, implementation and exploitation of defence research results by fostering collaboration, accelerating innovation and ensuring informed decision-making.

4.5.2 Planned measures for the strategic field of action

Introduction of a decentralised, accessible IT-supported management tool/research information system: The successfully established research management system should take an important step towards digitalisation in the near future in order to increase the importance of transparency, knowledge transfer and the implementation of research results. The activities that have already been undertaken to establish a research information system (ReIS) should therefore be pursued further and integrated

into a capability information, planning and control system (FIPS). As the good practice example of Finland shows, the research management process can be organised more efficiently and a knowledge management system can be created for all those involved in the research process.

Establishing the necessary personnel structures and capacities for the sustainable implementation of knowledge management: As already described in the personnel resources field of action, appropriate capacities must be created within the MOD/AAF to pursue the implementation of R&D projects. This applies to research management and the supervision of ReIS on the one hand, and to the research units and users on the other. Furthermore, appropriate capacities are also required for quality management.

Regulations on defence technology exports: A discussion of the national regulations on defence technology exports should be initiated to identify any need for amendments in order to expand the industry's sales market and, at the same time, protect sensitive research achievements. Special attention must also be paid to research results with a dual-use character. As the European Union is also working on framework conditions and standardisation in this area, it is important to observe these developments and, if necessary, to help shape them in a way that makes sense for Austria. At the national level, the advantages of joining the European Export Control Association for Research Organisations (EECARO) should be weighed up. EECARO is an association made up of universities and research and technology organisations (e.g. TNO in the Netherlands, Interuniversity Microelectronics Centre in Belgium, Fraunhofer-Gesellschaft in Germany). In Austria, universities and other non-university research organisations would therefore be sensible candidates for membership. The first initial discussion of this could be initiated informally by the MOD at periodic meetings.

Directors' Conference: The introduction of the Directors' Conference is an important measure for the transfer of knowledge within the organisation and should therefore be held for the first time in autumn 2024.

4.6 Field of action: Communication/public relations (PR)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4.6.1 Status

For the area of defence research, complementary measures are necessary that are more oriented towards the basic concepts of science communication. Recent examples of such measures include the annual FORTISSIMO conference as part of the FORTE defence research programme and the provision of information material as part of the Long Night of Research. For the future, there is a need for clearly formulated communication goals regarding defence research as well as a definition of the relevant target groups and the elements of the communication mix.

4.6.2 Planned measures for the strategic field of action

Establish targeted positioning of defence research among stakeholders: Embedded in the communication strategy of the MOD/AAF, a positioning of defence research should be established with all relevant stakeholders. A targeted research marketing concept must be developed and implemented for this purpose. This concept must also include internal MOD/AAF stakeholders. In addition to the development and implementation of the research marketing concept, the establishment of a simplified impact measurement of the communication measures via stakeholder surveys is also planned.

Intensifying communication with other ministries/partners: In order to intensify communication with external partners in the public sector as well as in research and industry, the MOD must define appropriate communication plans and external target groups.

Increased public appearances/media work: Defence research and its objectives and results should be increasingly communicated to the outside world via the available communication instruments and channels. In addition to well-established event formats, relevant digital media should also be used more regularly.

Highlight the R&D contribution made during procurement or product launches: In the case of technology-relevant procurements, the specific R&D contribution made by the MOD/AAF for this product should be identified and communicated, at least in the medium term, in order to bring about a targeted increase in R&D awareness for the benefit of R&D throughout the organisation.


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5 Implementation plan and required resources

The implementation plan presents the measures in the individual fields of action in a clear tabular form with regard to the time dimension and the additional resources required where necessary.

For the implementation of the strategy, the individual measures in the fields of action have the following timeframes up to 2036: the short term is set at one to three years, the medium term at four to seven years and the long term at eight to thirteen years from the start of implementation in 2024. If there is a dot in a cell in the table, this means that the measure should be completed within the respective period. However, the first initiation activities to implement the measure can begin earlier, regardless of the fulfilment deadline.

The implementation of many measures also requires a considerable amount of additional time in processing and can only be realised sustainably if additional personnel capacities are permanently available.

The implementation plan is an internal MOD document and is not intended for publication. It is therefore not shown in this external version.

6 Monitoring indicators for the strategy document

As described in Chapter 3, the strategic objectives of this Defence Research Strategy can be summarised in three complementary impact paths. An impact path is a simplified causal chain of events („productive interactions“) that link the activities carried out in a research programme or strategy with identifiable effects on the economy and society in a broader sense. While the first two impact paths („From challenges to new capabilities“ and „From new knowledge to new skills within the troops“) address expected effects within the MOD/AAF, the third impact path („From new technologies to strengthening the national defence industrial base“) focuses on effects in the defence industrial base. The following table provides both an allocation of the objectives and fields of action to the impact pathways and a corresponding structuring of the indicators.

The deadlines for the impact indicators are deliberately set longer than the deadlines for the implementation of measures, as an impact can only be meaningfully measured once a measure has been fulfilled and, as a result, has also been able to generate an impact.

The monitoring is purely internal to the Federal Ministry of Defence. The indicator tables are therefore not shown in this external version.

7 Annex 1: Definitions

Research
In contrast to accidental discovery, research is the systematic search for new findings and their documentation and publication.

Research and experimental development (R&D)
Research and experimental development (R&D) is creative and systematic work to expand the body of knowledge – including knowledge about humanity, culture and society – and to develop new applications based on existing knowledge. (Frascati Manual 2015, p.437)

The activity must be novel, creative, uncertain in terms of the end result, systematically transferable and/or reproducible.

The term R&D encompasses three types of research: basic research, applied research and experimental development.

Basic research
Basic research is experimental or theoretical work that primarily serves to gain new knowledge about the fundamental causes of phenomena and observable facts without having a particular application or use in mind. (Frascati Manual 2015, p.53)

Explanation:
Basic research refers to original investigations with the aim of gaining a precise and appropriate picture of reality. In basic research, properties, structures and interrelationships are analysed in order to formulate and test hypotheses, theories or laws. The results of basic research are generally not commercialised, but published in the form of scientific publications. Under certain circumstances, the publication of the results of basic research may be restricted for security reasons.

Applied research
Applied research is original work that is carried out to acquire new knowledge but is primarily focussed on a specific practical goal or outcome. (Frascati Manual 2015, p.54)

Explanation:
Applied research refers to original investigations with the aim of contributing to the solution of specific problems or preparing decisions. Applied research is conducted either to identify possible applications for the results of basic research, or to identify new ways or methods of achieving specific and predetermined goals. It includes the consideration of existing knowledge and its extension to solve specific problems.

Experimental Development
Experimental development is systematic work based on existing knowledge from research and practical experience, which in turn generates additional knowledge and is aimed at the manufacture of new products or processes or the improvement of existing products or processes. (Frascati Manual 2015, p.55)

Explanation:
Experimental development is the systematic application of knowledge with the aim of producing new and significantly improved materials, devices or systems. The development of new products or processes is also part of experimental development, provided it fulfils the criteria for the identification of R&D activities: novel, creative, open-ended, systematically transferable and/or reproducible.

Defence Research
Defence research is creative and systematic basic research, applied research and experimental development work guided by recognised, research-specific criteria. It is interdisciplinary in nature and focuses on making a timely and needs-based contribution to the early identification of future challenges and the further development of the capabilities of the Armed Forces to fulfil current and future tasks. It is fundamentally geared towards gaining new knowledge for national military defence. The range of defence research services relates in particular to people, materials, processes and capabilities. Its organisation is the sole responsibility of the MOD and comprises all research and development activities, which are carried out using the following four instruments

- intra-departmental research (MOD),
- contract research,
- cooperative research and
- national / international research programmes, including all recognised research funding opportunities.

Intra-departmental Research
Intra-departmental research is the instrument for meeting requirements in which research needs are covered by intra-departmental research institutions in specific research projects ordered in the annual defence research programme. Provisions must be made for participation or ongoing project support by the department submitting the requirements.

Contract Research
Contract research is an instrument for meeting needs in which specific research requirements are met by persons and organisations outside the department via the awarding of intellectual services and in compliance with the applicable legal provisions. Involvement and ongoing project support by the department that is responsible for meeting the demand or an internal department defined for this purpose is envisaged.

Funded Research
Research funding is provided directly through grants, loans and guarantees or indirectly through tax concessions.

In the case of direct research funding, a distinction is made between basic research, application-orientated/industry-related research and company-related business promotion in the technology sector. The institutional responsibilities are also derived from this distinction. Direct research funding comprises topic-orientated funding according to technology areas and open-topic funding and is provided through applications or participation in calls for proposals. Funding is awarded by the federal government, the federal states and the European Union (EU).

Under the Income Tax Act and the Corporation Tax Act, indirect research funding for tax purposes offers the opportunity to claim certain expenses for research and development against tax (https://www.usp.gv.at Unternehmensserviceportal).

The legal bases are the Research Funding Act (FoFinaG), the Research Promotion Companies Act (FFGG), the Research and Technology Promotion Act (FTFG), the Austria Business Service Act (AWSG), the Research Organisation Act (FOG), the Climate and Energy Fund Act (KLI.EN-FondsG), the RTD National Foundation Act (FTEG), the Income Tax Act (EStG), the Corporation Tax Act (KStG) and the Federal Ministries Act (BMG).

Cooperative Research
Cooperative research and development projects are collaborations between several consortium partners who work together on a joint project with defined R&D objectives. The R&D project can be set up either as industrial research (further from the market) or experimental development (closer to the market).

Military User
The term „Military User“ refers to specifically defined departments of the MOD or AAF that require new knowledge or findings from a research project in order to better fulfil their tasks, and subsequently also accompany the relevant R&D project, periodically

monitor and, if necessary, readjust interim results and also approve the results achieved in cooperation with the research management group at the end of the project.

Defence Research Programme
The Defence Research Programme is an essential interface document of the research process (sub-process 6 of the core process of defence policy management within the framework of the central processes of defence policy). It contains the annually updated overall presentation of the R&D projects ordered by the research steering authority of the MOD and the allocated budget funds in annual tangents.

Defence Research Management System
The Defence Research Management System is responsible for the direction and control of research activities for all matters relating to research and development. It includes the control, monitoring and evaluation of the research process, participation in the definition of the research-relevant organisational structure (the AAF's internal research facilities) as well as the documents in which the principles for research activities are laid down or which are required for control.

Defence Research System
The Defence Research System is the functional relationship between all components of defence research, which are related in an orderly manner to knowledge requirements, opportunities to meet needs through research institutions and R&D cooperation, programme and project participation, exploitation of results, R&D-specific quality management and publication activities (public relations) in order to ensure that the objectives of defence research are achieved.

Strategic R&D Areas (SRDA)
The strategic R&D area (SRDA) is an umbrella term for the classification of combined specialist or thematic areas directly related to defence research. They are described within the framework of the R&D process of the MOD/AAF and enable a practicable allocation of the specific knowledge requirements for the military sciences and capability development of the MOD/AAF.

Research Management Group (RMG)
A Research Management Group (RMG) is a committee made up of departments with specialist relevance to the respective strategic research and development area and is convened by the research steering authority of the MOD. The RMG deals with the completed, ongoing and new R&D project proposals of the respective SRDA. Among other things, this also serves to compare knowledge and discuss newly submitted R&D projects with regard to their inclusion in the defence research programme.

Explanation:
The following are invited to a RMG: Defence force planners, representatives of the troops, procuring specialist departments, representatives of relevant departments, experts, researchers and, if required, external experts.

The tasks are: Definition of research needs, development of new ideas and proposals, coordination of actors in the R&D process, preparation of contributions to the research programme, participation in the revision of the defence research strategy, supervision and evaluation of ongoing research projects and assessment or review of the final results.

Military Sciences
Military Sciences refers to the entirety of all scientific fields related to security and defence policy and the basis for the design and use of armed forces.
On the one hand, it examines the justification dimension of military action, the phenomenon of war and its causes, the strategic action of the political community to ensure survival in the sense of securing peace and protecting the living environment, as well as the entire area of the defence required for this. On the other hand, the task of military science is the systematic acquisition of application-orientated knowledge for the military itself, its preparation for deployment, the training and education of soldiers, the leadership processes appropriate to the military command levels and the parameters of military action in peace and deployment.

Military Science
Military science in this sense is a system for generating knowledge and expanding knowledge about the essential characteristics, causal relationships and laws of the use and deployment of the military as an instrument, which is defined in the form of theories, laws, concepts and categories. The contribution of the military as an instrument of security policy strategy formation through policy advice and the provision of military science expertise, the justification dimension of military action and the planning, maintenance and management of the military as an instrument can be cited as a separate object of knowledge or a separate problem derived from it.

This includes general military leadership, military strategy, operations, tactics, military logistics and force maintenance.

8 Annex 2: Abbreviations

CBRN	Chemical, Biological, Radiological, Nuclear
AIM AT	Artificial Intelligence Mission Austria
ASAP	Austrian Space Applications Programme
AUT	Austria
BMAW	Federal Ministry of Labour and Economy
BMBWF	Federal Ministry of Education, Science and Research
BMF	Federal Ministry of Finance
BMI	Federal Ministry of the Interior
BMJ	Federal Ministry of Justice
BMK	Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology
MOD	Federal Ministry of Defence
C-IED	Counter-Improvised Explosive Devices
DACH	Acronym for „Deutschland-Austria-Confoederatio Helvetica“ (Germany-Austria-Switzerland)
DIANA	Defence Innovation Accelerator for the North Atlantic
ECFR	European Council on Foreign Relations
EDA	European Defence Agency
EDA CapTechs	Capability Technology Areas of the European Defence Agency
EDF	European Defence Fund
EECARO	European Export Control Association for Research Organisations
EW	Electronic Warfare
ENIN	Emissionsfreie Nutzfahrzeuge und Infrastruktur/ Emission-free Commercial Vehicles and Infrastructure
EU	European Union
EU ISS	European Union Institute for Security Studies

R&D	Research and Development
FDRA	Finnish Defence Research Agency
FIPS	Capability Information, Planning and Control System
RMG	Research Management Group
FOI	Totalförsvarets forskningsinstitut/ Swedish Defence Research Agency
RTI	Research, Technology and Innovation
ICT	Information- and Communication Technology
IPCEI	Important Projects of Common European Interest
IT	Information Technology
JEDI	Joint European Disruptive Initiative
JRC	Joint Research Centre
AI	Artificial Intelligence
NATO	North Atlantic Treaty Organisation
NATO STO	NATO Science and Technology Organisation
AAF	Austrian Armed Forces
POC	Point of Contact
ReIS	Research Information System (Digitales Forschungsmanagementsystem)
SRDA	Strategic R&D area
TFP	Technology Foresight Process
TNO	Nederlandse Organisatie voor toegepast-natuurwetenschappelijk onder-zoek/ Netherlands Organisation for Applied Scientific Research
UNIDIR	United Nations Institute for Disarmament Research
ReIS	Research Information System
SFEB	Strategischer Forschungs- und Entwicklungsbereich
TFP	Technology Foresight Prozess
TNO	Niederländische Organisation für Angewandte Naturwissenschaftliche Forschung
UNIDIR	United Nations Institute for Disarmament Research

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