



DEPARTMENT OF DEFENSE INTERNATIONAL SCIENCE AND TECHNOLOGY ENGAGEMENT STRATEGY

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A UNIFIED APPROACH TO STRENGTHEN
ALLIANCES AND ATTRACT NEW PARTNERS

Department of Defense
OFFICE OF PREPUBLICATION AND SECURITY REVIEW



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FOREWORD

The U.S. Department of Defense (DoD) has long relied on its historical technological superiority to maintain its military advantage. The increasing globalization of science and technology (S&T) and its rapid pace of advancement, coupled with the ever-changing security environment, have gradually eroded U.S. leadership. To retain the technological edge in future conflicts the U.S. DoD must complement and invigorate its domestic innovation base with these global sources of S&T.

Since the Second World War, the United States has collaborated with its allies to develop the technologies needed for defense, such as radar, submarines, protective clothing, and medicines. With the re-emergence of long-term great power competition with China and Russia, along with rapid proliferation of technologies and new concepts of warfare, the United States must seek to shape the international security environment for national and allied interests by capitalizing on global S&T innovation.

To do this the Defense S&T community must stay abreast of emerging S&T around the world, leverage others' investments, and seek out collaborations in areas where researchers need to remain at the leading edge. To fully leverage these advances and to make strategic research investments, the U.S. DoD must assess with whom and in which areas we should collaborate. Such assessments should be based on the value that the S&T collaboration creates for the Defense mission and for the relationship with the collaborating nation(s). Specifically, the collaboration should enhance existing U.S. defense capabilities, enable us to undertake new missions or activities that previously could not be accomplished, or further the development of a long-term strategic partnership with another country.

This Strategy implements the 2018 National Defense Strategy (NDS) directive to **strengthen alliances and attract new partners** for the Defense S&T enterprise. It seeks to **reform the Department's business practices** for international S&T engagement, to maximize return on investment and ultimately **build a more lethal Force** in partnership with our allies. The Strategy leverages and builds upon ongoing international engagement by the Combatant Commands, Military Services, and the laboratories and agencies that comprise the U.S. DoD S&T enterprise. It establishes a framework to unify the Department's approach to international S&T engagement, and codifies the role that the Under Secretary of Defense for Research and Engineering (USD(R&E)) plays in coordinating the Department's international S&T activities.

Taken collectively, the breadth and scope of U.S. DoD-organized and -led S&T activities demonstrate our commitment to staying at the forefront of S&T for defense and national security. Only in cooperation with our allies and partners can we give our warfighters the best possible capabilities, in the shortest possible time, to support our global interests. To this end, I commend this Strategy to you, and encourage adoption of the key Principles and Framework described herein across the Department.



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Acting Under Secretary of Defense
for Research and Engineering

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SECTION I: THE STRATEGY

INTRODUCTION

Consistent with DoD Directive 5137.02,¹ the Under Secretary of Defense for Research and Engineering is responsible for overseeing and representing the Department of Defense (DoD) on all international science and technology (S&T) activities, and for maintaining an international S&T engagement strategy. This document implements that organizational directive and describes the U.S. DoD strategy for international collaborative S&T engagements.

BACKGROUND

Since the last such strategy was published in 2014,² the Department has borne witness to substantial change. The re-emergence of long-term strategic competition and rapid dispersion of technologies across the globe have changed the character of war and eroded U.S. competitive military advantage. In an effort to better pursue technological superiority the Office of the Secretary of Defense (OSD) has been restructured in the most significant transformation to technology and acquisition in a generation. The new Under Secretaries of Defense for Research and Engineering (USD(R&E)) and Acquisition and Sustainment (USD(A&S)) must now drive innovation and accelerate the advancement of warfighting capability to deliver proven technology to the warfighter more quickly and affordably than ever before. To achieve this our Defense S&T communities must stay abreast of emerging S&T around the world, leverage others' investments, and actively seek leading-edge research collaborations.

International cooperation has long supported U.S. DoD S&T objectives and has provided invaluable contributions to U.S. and allies' warfighting capabilities since the Second World War (WWII). Such cooperation is a key device in U.S. diplomatic relations and underpins many of our closest alliances and partnerships. In the context of resurgent threats to U.S. dominance on the battlefield and competition for resources across Government, we must prioritize research that delivers transformational warfighting capabilities and offers value for money. Our international S&T engagement must therefore be strategically directed, properly executed, and effectively utilized. Only then can we retain technological superiority and achieve our defense objectives, by delivering valuable S&T outcomes at the speed of relevance. This is imperative, for if we do not choose our international S&T engagements wisely, if we cannot cooperate with our allies effectively, or fail to leverage the products of our cooperative S&T, we cannot hope to maintain technological superiority on the battlefield. Failure will further widen the gap between U.S. warfighting technologies and those of our closest competitors.

¹ The Under Secretary of Defense for Research and Engineering "oversees and represents the DoD on all international S&T activities and coordinates with the USD(A&S) and Under Secretary of Defense for Policy (USD(P)), as appropriate, on DoD international engagements, to include North Atlantic Treaty Organization components, allies, and friendly foreign partners. Maintains an international S&T engagement strategy." DoD Directive 5137.02, "Under Secretary of Defense (Research and Engineering) (USD(R&E))," Section 2.1(5), July 15, 2020, p. 6.

² International S&T Engagement Strategy, USD(AT&L) and ASD(R&E), July 2014.

SCOPE

International S&T cooperation is performed by Components³ across the Department, each with specific mission objectives and priorities, and – in some cases – pre-existing engagement strategies. This Strategy was not developed in isolation – rather, it drew upon these inputs, in addition to Defense policy and strategy documents. It is the product of Component contributions and has been subject to broad Departmental review and iteration. Accordingly, this Strategy is not designed to supplant Component-led international cooperative activity, but intended to describe a structure for creating enhanced awareness, coordination, and strategic planning of defense international S&T engagements. It recognizes the importance of Component independence and does not seek to prescribe a single unified portfolio. Instead, this Strategy provides a framework to unify our *approach* to international S&T engagement across U.S. DoD Components. It seeks to complement Component strategies for international S&T engagement, rather than prescribe specific S&T outcomes.

The intended audience for this Strategy is all U.S. DoD personnel engaged in international S&T cooperative activities, including Combatant Commands (CCMDs), Military Services, Laboratories, and Defense Agencies.

The Strategy focuses on U.S. DoD-led and –managed international S&T endeavors and does not pertain to acquisition, sustainment, testing, or foreign military sales (FMS) which are the purview of other U.S. DoD organizations. Our definition of S&T in the field of defense and related national security interests includes, but is not limited to, analysis, research, development, testing, evaluation, prototyping, demonstrations, experimentation, and effectiveness evaluation activities that enhance collective, operational, and non-operational capabilities. The Strategy addresses government-to-government engagements and offers a strategic perspective for U.S. DoD-sponsored coalition, industry, and academic research.

OUTLINE

This document is divided into two main sections. In this **Section I**, following the introduction, there are four subsections. **Strategic Context** references the key policy and strategy documents from which this Strategy derives and interprets the strategic security environment for the purposes of international S&T engagement. **Foundation** presents the Mission and Vision for international S&T engagement across the Department and outlines the Objectives of the Strategy. **Approach** introduces the concepts necessary to achieve the Vision and overcome challenges to international S&T cooperation. And, lastly, **Implementation** outlines the actions necessary to achieve the Objectives.

Section II is reserved for the **Framework**, which expounds upon the Approach and provides details necessary to implement the Strategy across the Department. It is distinct from the rest of the Strategy in the level of detail presented, and is essential reading for anyone involved in making decisions concerning international S&T activities.

STRATEGIC CONTEXT

SECURITY ENVIRONMENT

The 2017 *National Security Strategy* (NSS) and 2018 *National Defense Strategy* (NDS) well articulate the increasingly complex global security environment and strategic threats to America, summarized here as:

³ U.S. DoD Components engaged in international S&T cooperation are defined as the Combatant Commands, the Military Services, and the Laboratories and Agencies within the Services and across the Fourth Estate.

- The re-emergence of long-term, strategic competition from revisionist powers
- Overt challenges to the free and open international order established after WWII and the subsequent decline of rules-based international order
- Rapid advances and global dispersion of technologies, coupled with the spiraling cost of military technology acquisition, which has eroded U.S. technological superiority
- Challenges from adversaries in every operating domain, with new concepts of warfare that span the entire spectrum of conflict, that are changing the character of war

Together, this presents a security environment more complex and volatile than we have experienced in recent memory.

Concerning the global dispersion of technologies, the Director of National Intelligence's (DNI) Worldwide Threat Assessment for 2019 identifies specific emerging and disruptive technologies that threaten our military and economic competitiveness. The DNI's Assessment recognizes that "innovations will increasingly originate outside the United States, as the overall U.S. lead in S&T shrinks, the capability gap between commercial and military technologies evaporates, and foreign actors increase their efforts to acquire top talent, companies, data, and intellectual property via licit and illicit means."⁴

STRATEGIC DIRECTION

To tackle this threat, the NDS expresses the need to **strengthen alliances and attract new partners** as one of three priorities for Defense. International defense S&T cooperation already underpins many of our closest alliances and partnerships, and we should seek to deepen these relationships where appropriate to advance U.S. interests and strengthen allied capability and interoperability. Where possible, we should transcend our existing transactional relationships and strive for **strategic partnerships** that deliver valuable cooperative outcomes with the agility and pace our partners expect. So, too, must we develop and nurture new relationships with non-traditional international partners that will, in time, yield benefits to the United States, through access to national S&T capability or otherwise. This supports two fundamental elements of the NDS focus area of strengthening alliances and attracting new partners: **deepen interoperability** with key allies, and **expand our regional consultative mechanisms and collaborative planning**. How we choose to prioritize our international engagement efforts and balance limited resources between strengthening existing alliances and forging new partnerships are key.

The National Defense Science and Technology Strategy (NDSTS), published in September 2019, describes how the whole Defense S&T enterprise shall work in harmony to achieve the Department's S&T objectives. As an integral part of the enterprise, international S&T cooperation must reflect the priorities outlined in the NDSTS and create valuable outcomes for defense S&T. DoD's Modernization Priorities⁵ define the crucial technology priority areas for defense, to which our national and international S&T endeavors should align and support. As an important element in U.S. international relations, S&T cooperation may also be influenced by national and departmental international policy and strategy where appropriate. For example, Congress has

⁴ Director of National Intelligence, Statement for the Record: 2019 Worldwide Threat Assessment of the US Intelligence Community, Senate Select Committee on Intelligence, 29 January 2019

⁵ <http://www.cto.mil/modernization-priorities>. To date, these DoD Modernization Priorities are: Artificial Intelligence, Autonomy, Biotechnology, Cyber, Directed Energy, Fully Networked Command, Control, and Communications (FNC3), Hypersonics, Microelectronics, Quantum Science, Space, and 5G. See: <https://www.cto.mil/modernization-priorities/>.

previously directed the U.S. DoD to build new cooperative relationships with non-traditional defense partners such as India,⁶ which influence and shape the international S&T portfolio.

There are a range of benefits to cooperation beyond access to foreign S&T. The Joint Publication (JP) on Security Cooperation (SC), JP 3-20, defines these “Purposes” and prescribes a Planning Framework to translate regional security objectives into country-specific plans.⁷ JP 3-20 identifies International Armaments Cooperation (IAC) – of which international S&T cooperation is a component – as one of nine categories of SC activity. IAC encompasses defense-related international research, development, production, and support activities involving cooperation between the United States Government and foreign nations’ governments and industries. Cooperative S&T may include information exchange, personnel exchange, and foreign comparative testing as well as jointly-funded research and development (R&D).

INTERNATIONAL COMMITMENTS

The United States is committed to several multinational alliances with implications for S&T. Since WWII, we have worked with researchers from our “five-eyes” (FVEY) partners (Australia, Canada, New Zealand, and the United Kingdom) under The Technical Cooperation Program (TTCP). The U.S. DoD is also an active participant in S&T alliances such as the North Atlantic Treaty Organization’s Science and Technology Organization (NATO STO). In addition, the United States is committed to bilateral engagement with our treaty allies, such as France, the Republic of Korea, Japan, and others. These strategic alliances of free and sovereign states afford the United States a great advantage over our competitors, enabling us to leverage allied S&T capabilities and influence our allies’ defense S&T investments.

Now, as the NSS and NDS assert, the United States is encouraging NATO members to assume a fairer share of responsibility and fulfil their commitments to increase defense and modernization spending. Accordingly, we must ensure that our international S&T cooperation benefits the United States as much as it does our allies. In doing so we shall support a third element of the NDS focus area to strengthen alliances and attract new partners: **to uphold a foundation of mutual respect, responsibility, priorities, and accountability**. Our alliances are a powerful instrument of our defense and security arsenal and provide a durable, asymmetric strategic advantage that no competitor or rival can match. Through these alliances we may unite the allied S&T community to rise to the challenge posed by strategic competitors such as Russia and China. Together, we must pre-empt our adversaries’ technological advances through focused international S&T cooperation.

TECHNOLOGY PROTECTION

The 2017 NSS recognized the importance of protecting our technologies from falling into the hands of foreign powers that would seek to use them to gain an advantage over the United States. Rivals such as China have employed sophisticated, subversive techniques as well as largely legitimate, legal means to infiltrate our national security innovation base and exfiltrate our intellectual property and proprietary information to advance their own capabilities and erode America’s long-term competitive advantages. It is imperative that we reduce the illicit appropriation of U.S. public and private sector technology and technical knowledge by hostile foreign competitors. Clearly, this must be a consideration when engaging in any form of international S&T cooperation. Furthermore, the evolving international relationships between nations with whom we choose to partner and those that we choose not to present a strategic risk that we must manage throughout our international cooperation. The Strategic Technology Protection and Exploitation (STP&E) directorate established within OUSD(R&E) provides technology-specific guidance in the form of Technology Area Protection Plans (TAPPs) to help ensure that our most valuable technologies are protected and exploited for U.S. advantage.

⁶ <https://www.defense.gov/Newsroom/Releases/Release/Article/1024228/joint-india-united-states-statement-on-the-visit-of-secretary-of-defense-carter>

⁷ Joint Publication 3-20 on Security Cooperation, Chapters I and III, 23 May 2017

Navigating through all these factors to pursue the optimum international S&T portfolio is non-trivial. This is further compounded by limited resources to undertake international engagements, which often take place in multiple overlapping fora. This effort must therefore be directed by a strategy that addresses these issues and provides a structured framework to aid decision-makers. To engage in international S&T without due consideration of the factors described herein risks a suboptimum portfolio and may waste valuable departmental resources. If we fail to maintain awareness of emerging technological advances, and to engage and collaborate with those who lead their fields, the United States will fall behind, with dramatic implications for economic competitiveness and national security.⁸ The next section of this Strategy describes the Mission and Vision for all international S&T engagement and outlines its Objectives.

⁸ Strategic Engagement in Global S&T: Opportunities for Defense Research, National Academies Press, 2014

FOUNDATION

International S&T cooperation is conducted by DoD Components across the U.S. DoD, each with its own organization-specific mission and objectives for international engagement. To encapsulate these activities, this Strategy describes a Mission for the Department's collective international S&T engagement as follows:

MISSION

Maintain awareness of, and ultimately leverage, defense- and security-relevant S&T capabilities developed outside the United States, and develop strategic defense relationships with other countries to access these capabilities, maximize coalition interoperability, and achieve U.S. national security objectives

The **Vision** of this Strategy describes the *desired end state* for international S&T cooperation toward which the Department should strive. This Vision is defined as:

VISION

- **Consistently deliberate engagement** with our allies and partners, directed according to our national priorities, foreign capabilities and international policy
- **Shared awareness**, across the Department, **of global sources of technology** and a common understanding of how it may be leveraged to achieve U.S. defense objectives
- **Well-established international relationships** in accordance with international policy and **effective mechanisms for cooperation** to access and leverage the global technology base
- **Visible senior leaders**, engaging with their foreign equivalents in manageable (time-sensitive) circumstances, to promote and steer international cooperation
- **Thriving international networks** of researchers with **flourishing collaborations** in priority S&T areas that produce high-value outcomes to accelerate the pace of U.S. R&D and ultimately benefit the defense and security mission
- **Continuous improvement** to business processes underpinning international engagement, adoption of best practices and innovative mechanisms for cooperation

This Strategy also extends the Vision to describe an ideal Department-wide **portfolio** of international S&T. This is characterized as a *continuously-optimized portfolio of deliberate cooperative engagements*, that:

- Is aligned and responsive to the changing geopolitical landscape and national defense and security priorities
- Comprises a variety of collaborative endeavors ranging from information and burden sharing to strategic partnerships that create unique value to participating nations
- Maximizes leverage of foreign S&T capability for U.S. benefit
- Is integrated into, and benefits, funded programs of record
- Is executed autonomously across the DoD Components, with efficient and effective management, and coordination from within OSD⁹
- Underpins interoperability with allies to assure coalition dominance in operations and effective S&T transfer

⁹ The relationship between OSD and other Components executing the international S&T portfolio is expounded upon in the Framework, subsection 2.

To realize the Vision this Strategy defines the following Principles to govern all our international S&T activities as follows:

PRINCIPLES

- All international S&T engagement shall be aligned to, and primarily serve, U.S. national interests as represented in national defense and security objectives, specific S&T needs, and/or international policy
- International S&T engagement shall be balanced between nurturing and strengthening existing alliances and forging new partnerships as necessary to secure U.S. access to world-class S&T and achieve desired defense posture
- International S&T investments and resources shall be prioritized according to U.S. S&T needs, foreign S&T strengths and opportunities, and U.S. policy
- International S&T cooperation shall protect the security of critical U.S. technologies
- All international collaborative S&T shall be justified with benefits that, on balance, exceed that which could be achieved through independent national work
- International S&T cooperation shall be equitable for all parties; that is, the total value of national contributions (monetary and in-kind) versus benefits received must be equivalent
- International collaborative S&T shall strive for measurable outcomes that accelerate the pace of U.S. R&D and ultimately benefit the defense mission
- International S&T cooperation shall be underpinned by suitable agreements and arrangements that offer flexibility, minimal burden in setup and renewal, and rapid execution
- Business processes for international S&T shall enable timely and effective interactions and accommodate varying foreign governmental requirements

All Components of U.S. DoD engaged in international S&T cooperation should ensure that their activities are aligned to this Mission and Vision, and conducted according to the Principles. The purpose of this Strategy is to set the Department on a path to achieve the Vision through the adoption/application of the Principles. The specific Objectives of this Strategy are therefore to:

OBJECTIVES

- Provide guidance to all DoD Components engaged in international S&T cooperation to embed the Principles across the Department and achieve the Vision
- Establish a common framework to unify cross-Departmental approaches to international S&T engagement, coordinate efforts, and ensure consistent application of the Principles
- Ensure that all international S&T engagement is demonstrably deliberate, through rational appraisal of our S&T needs and priorities, foreign S&T strengths and opportunities, and U.S. policy
- Transform the U.S. DoD's collective international S&T activity into an optimized portfolio of deliberate cooperative engagements, underpinned by appropriate agreements

Optimizing the portfolio of international S&T activity across the U.S. DoD is non-trivial, as it involves many factors that demand careful consideration. Moreover, the portfolio comprises Component-led activity that is not governed or controlled by a single entity. This Strategy recognizes the importance of DoD Component independence and does not seek to prescribe a single unified portfolio. Instead, this Strategy provides a framework to unify our *approach* to international S&T engagement across U.S. DoD Components.

APPROACH

PLAN FOR DELIBERATE ENGAGEMENT

In order to influence our international S&T activities in a coherent fashion it is first necessary to determine with whom, and in what S&T fields, we wish to collaborate. This is essential to achieve **deliberate engagement**. We must do this holistically, at the DoD Component level and above, rather than piecemeal by country or S&T topic, if we are to **optimize the portfolio**. Directing our engagement in this manner requires consideration of numerous factors that are discussed in the Framework section of this document. While these factors can and should be applied to evaluate individual activities and prospects for cooperation, we should avoid the temptation to review and adjust the portfolio piece-by-piece. Only by defining our target engagement goals can we strategically direct our engagement efforts and optimize the portfolio.

This Strategy intentionally refrains from prescribing specific S&T to pursue or nations to partner with, for this is a DoD Component prerogative. Instead, it provides a framework for Components to develop optimal international S&T engagement **Plans** based on their unique mission and objectives. The Plan shall describe the DoD Component's intents for international S&T engagement, specifically the cooperative S&T to be sought matched with the foreign nation(s) that are most suited for it. The Plan shall also summarize the Component's existing portfolio of international cooperative S&T and identify any dependencies between international and domestic S&T programs. This information may then be used to adjust the portfolio as necessary to meet the Component's S&T needs.

Such activity already takes place, to varying degrees, within DoD Component organizations. In some cases, the planning process is well established, involving systematic appraisal of international S&T opportunities according to organizational needs. The framework approach presented herein is not intended to replace this good practice, but to augment it, and to facilitate **coordination** among DoD Component plans.

COORDINATE PLANS ACROSS THE DEPARTMENT

Coordination is fundamental to achieving the Vision and delivering an optimal portfolio of international S&T. Without coordination among the Departmental entities conducting international S&T we risk duplicating effort and potentially conveying confusing or even conflicting messages to our partners. Thus, it is essential that DoD Component international S&T engagement plans are shared for the purposes of deconfliction prior to their execution. As noted earlier, DoDD 5137.02 notes the responsibility of the USD(R&E) for overseeing and representing the DoD on all international S&T activities, coordinating with the Under Secretaries of Defense for Acquisition and Sustainment (USD(A&S)) and Policy (USD(P)) as appropriate, on international engagements. Effective representation necessitates both coordination and understanding of DoD Component plans for international S&T engagement but does not mandate a single international S&T portfolio across the Department.

For efficient coordination such plans should be readily understandable by all DoD Components and stakeholders. They should therefore be consistent in structure and terminology (as defined in the Framework section), to aid integration and to minimize the scope for ambiguity and misinterpretation. This Strategy formalizes the definition of an International S&T Engagement Plan (henceforth referred to simply as a "Plan") and provides guidance for its development, coordination and implementation.

There is no requirement for a single, unified Plan across the Department, just as there is no unified international S&T portfolio. Instead, DoD Components shall be responsible for developing, sharing and – following coordination – executing their Plan. This affords DoD Components the freedom to devise their Plan according to local procedures and timescales, while benefitting from the framework guidance and cross-Departmental coordination procedure described herein. There is no expectation that Plans will be developed

immediately or even concurrently; rather, it is hoped that that DoD Components will adopt this framework approach for their next planning cycle.

Not all DoD Components engaged in international S&T (as defined herein) require a coordinated Plan. Plans will be necessary for each of the Services as well as certain R&D organizations within the U.S. DoD, such as the Defense Advanced Research Projects Agency (DARPA), the Defense Threat Reduction Agency (DTRA), the Missile Defense Agency (MDA), and others. These DoD Components engage in substantial international cooperation which warrants a coordinated approach. The CCMDs contribute to the demand signal, and while they may directly engage in certain aspects of international S&T (such as cooperative testing and evaluation), their equities should typically be captured in Service Plans.¹⁰ The set of DoD Components requiring coordinated Plans should be monitored and revisited as the Department reconfigures itself over time.

For brevity, further details concerning the development, coordination and execution of Plans are consigned to the Framework section of this document. The remainder of this section is dedicated to the activities required to implement the Strategy.

ESTABLISH A COMMUNITY AND CONVENE FOR ACTION

This Strategy recognizes that international S&T cooperation is performed by DoD Components across the Department, and acknowledges that adoption of the framework approach requires coordinated action. Several OUSD(R&E)-led initiatives already exist to bring together S&T leaders and practitioners from across the Department together, such as the S&T Executive Committee (ExCom) and Reliance 21 Communities of Interest (COIs).¹¹ Feedback from DoD Components suggests that the community of international outreach leaders and practitioners would benefit from a dedicated forum in which to share knowledge and plans, and ultimately implement the Strategy. However, this community needs to be seen as beneficial to the work of its individual member organizations and not as a burdensome activity.

This community, comprising DoD Component international offices and other stakeholder bodies, could convene on a regular basis. Existing governance fora, such as S&T ExCom and/or Deputies meetings, may be leveraged for this purpose provided that it meets the needs of the community and does not undermine the purpose of these fora. The composition of this community may include, but is not limited to:

- OUSD(R&E) International Outreach and Policy (IO&P)
- OUSD(R&E) Agencies, including:
 - DARPA International Cooperation
 - MDA International & Policy
- OUSD(A&S) International Cooperation (IC)
- OUSD(A&S) DTRA External Engagement
- OUSD(Policy), including:
 - International Security Affairs
 - Security Cooperation within Strategy, Plans, and Capabilities
 - Combating Terrorism Technical Support Office (CTTSO)

(continued overleaf)

¹⁰ The U.S. Special Operations Command (SOCOM) is an example of a CCMD that undertakes substantial international S&T independently from the Services, and may require a dedicated Plan.

¹¹ Reliance 21 Operating Principles: Bringing Together the U.S. DoD Science and Technology Enterprise, 2014

Military Service international and S&T functions, including representatives from the following offices:¹²

- Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASD(ALT)), including:
 - Deputy Assistant Secretary for Defense Exports and Cooperation (DASA-DEC)
 - Army Futures Command (AFC) International Technology Centers (ITCs)
- Deputy Assistant Secretary of the Navy for Research, Development, Test and Evaluation (DASN(RDTE)), including:
 - Navy International Programs Office (NIPO)
 - Directorate of Innovation Technology Requirements, and Test and Evaluation (OPNAV-N94) International Engagement Office
 - Office of Naval Research (ONR) and ONR Global (ONRG)
- Assistant Secretary of the Air Force for Acquisition, Technology, and Logistics
- Deputy Under Secretary of the Air Force International Affairs (SAF/IA)
- Air Force Research Laboratory (AFRL) International Cooperation Office and Air Force Office of Scientific Research (AFOSR)

The Director, IO&P, shall establish the community and, in the first instance at least, facilitate the coordination meetings to implement the Strategy.

IMPLEMENTATION

To realize the Objectives of this Strategy, the following DoD Component actions are recommended:

ACTIONS

1. **Embrace the Principles** by integrating them into DoD Component policies and procedures as necessary, and advocate/incentivize corresponding organizational behaviors for international S&T engagement
2. **Adopt the Framework** for international S&T engagement planning, specifically:
 - a. Prepare to share a Component Plan no later than 12 months after initial publication of this Strategy
 - b. Support coordination of Plans by proffering feedback on other Component Plans in a timely fashion and accommodating changes to own Plan in response to feedback
 - c. Honor the coordinated Component Plan by making changes as necessary to the portfolio of international S&T
3. **Commit to Engagement** with the international S&T outreach community, including Component representation at strategy implementation meetings

This concludes the main body of the Strategy. The remainder of this document is dedicated to the Framework, and provides detailed guidance to assist with the planning, coordination and execution of Component Plans.

¹² As of this writing, the United States Space Force is a new Service and should be included as circumstances, interest, and resources allow in the near term.

SECTION II: THE FRAMEWORK

The Framework is divided into sections describing each of the three main steps to achieve deliberate engagement through the Plan: Preparation; Coordination; and Execution. Figure 1, below, depicts these steps in sequence.



Figure 1 Sequence of activity to develop, coordinate and execute International S&T Engagement Plans

During **preparation**, the DoD Component reviews the demand signal for S&T and international cooperation in the context of mission objectives and strategic drivers. This step should be conducted in parallel with other Component-level planning activities, to maximize coherence. The output is an indicative Component international S&T engagement Plan that then undergoes **coordination** across other DoD Components, facilitated by OUSD(R&E). The coordinated Plan is then **executed** by the DoD Component.

As a *planning* process, it is not necessary to repeat this sequence for each and every Component-level international engagement that arises. Rather, the preparation and coordination steps should be conducted on an infrequent yet regular basis that aligns to other Departmental or Component-level planning cycles, or whenever a significant shift in policy occurs. DoD Components are then free to execute and adjust their international S&T portfolio in accordance with their agreed Plan without further coordination, until the next planning cycle.

The three steps are described in more detail over the next three subsections of the Framework.

1. PREPARE THE PLAN

This section explores the factors to consider in developing the Plan, offers a systematic approach to analyze these inputs, and prescribes a common structure to present the resulting Plan. There are four distinct inputs that must be assembled into the Plan, illustrated in Figure 2 and described in the following subsections.

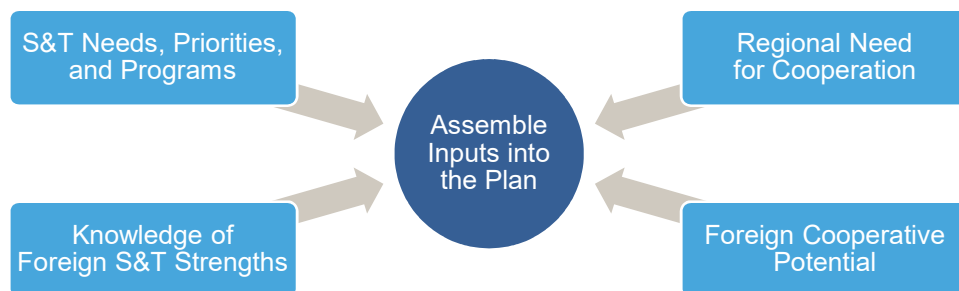


Figure 2 Set of independent inputs to be considered in development of the Plan.

1.1. UNDERSTAND OUR S&T NEEDS, PRIORITIES, AND PROGRAMS

To build the Plan we must first understand our S&T needs and priorities, and the domestic and international programs we already have in place to address these. Such inputs are necessary to formulate domestic S&T programs as well as international S&T cooperation, and the approach is similar: (re)-examine the demand signal, compare with planned program activity to identify gaps, prioritize these gaps, and then adjust the portfolio as necessary. Where international S&T engagement planning deviates from this well-established departmental process is the subject of the next three subsections. Thus, pre-existing products describing our S&T needs, priorities and programs – such as Component S&T strategies, plans, and roadmaps – should be leveraged where appropriate; it is not necessary to duplicate this activity to construct the international S&T engagement Plan.

Unmet S&T needs are prime candidates for international S&T cooperation, but so too must we consider opening our existing domestic programs to international cooperation where we stand to benefit. There may be opportunities for allies and partners to add value to our domestic R&D programs, or we may wish to undertake S&T cooperation in these areas to achieve other strategic military or political goals with certain nations. Naturally, there may be some S&T programs we could not conceivably cooperate on, in which case we may omit these from the Plan.

The S&T need itself is a combination of several inputs. Our S&T programs, which are predominantly sponsored and led by the Services, are primarily driven by the demand signal from the CCMDs. Each CCMD produces an Integrated Priority List (IPL) annually, which identifies capability gaps that may adversely affect the CCMD mission, prioritized across Service and functional lines. In partnership with the Services, the CCMD may then associate technology transition projects, that directly support mature capability development, with the highest priority gaps. The resulting internal planning document, the Science and Technology Integrated Priority List (STIPL), defines the technology-based capabilities needed from the defense R&D enterprise, including international cooperative S&T. (In some cases, where the IPL directly references technology priorities, a corresponding STIPL is not issued.)

The IPLs/STIPLs are primary sources for S&T needs and priorities, and DoD Components must incorporate the CCMD demand signal into their own S&T strategies and programs while taking OSD direction into account. USD(R&E) has identified several Modernization Priorities for the Department, with additional S&T drivers defined in the NDSTS. DoD Components may identify domain- or organization-specific S&T priorities according to their respective missions; however, these should align with and support the Modernization Priorities. The DNI's Worldwide Threat Assessment surveys and identifies global technology trends that may, too, shape U.S. priorities for S&T cooperation.

OUSD(R&E)'s Principal Directors of Modernization Priorities publish technology roadmaps that draw together Component programs in these high-priority areas. The COIs established under the Reliance 21 framework coordinate cross-cutting S&T across Components and also generate technology roadmaps. These roadmaps offer valuable insights into future S&T program plans and should inform the Plan.

To promote shared awareness and integration across the defense S&T community, Component Plans should describe S&T needs and priorities in a consistent terminology. The COIs maintain S&T taxonomies that should be used for this purpose. Any S&T in which the United States cannot cooperate with foreign governments, for reasons of national security or otherwise, can be excluded from the international S&T taxonomy.

1.2. UNDERSTAND FOREIGN S&T STRENGTHS

Armed with knowledge of our S&T needs and priorities, we may then seek to understand the global sources of S&T that meet those needs, especially where our national S&T capability is insufficient or would enable us

to undertake activities or missions that we could not do before. There are a variety of approaches to this that may suit DoD Components differently.

Systematic survey by country, based on open source data (such as the Organization for Economic Cooperation and Development's (OECD) science performance and government researchers' metrics¹³) or internal products, is one approach. Some of the Service S&T organizations' international offices already produce defense S&T assessments by region, which should be leveraged where applicable. Staff in Defense Attaché Offices (DAO) and Offices of Defense Cooperation (ODC) in our foreign embassies may develop similar products or otherwise provide valuable insights to a nation's S&T capability. We may also canvas our researchers and S&T leaders – including but not limited to participants of COIs – who maintain a network of international contacts to inform our assessment. There is often no substitute for direct interpersonal engagement with researchers in foreign governments, academic institutions and businesses, and knowledge gained from such interactions may already be captured by our international offices. For countries where we have a pre-existing S&T relationship, we may acknowledge their assertions of strength in certain fields, albeit moderated by our own independent assessment. It may be necessary to explore multiple avenues and integrate the results to generate a complete picture.

A nation may have S&T strengths outside of their Defense Department or Ministry, in academia or industry, that may be accessible to the United States. In today's connected world with its global economy, academics and private sector companies routinely work internationally to advance their interests. There are implications for cooperating with the U.S. DoD, however. It may or may not be necessary to involve that nation's government in the pursuit of their academic or industrial S&T for defense purposes, depending on their international policy. It is likely, however, that S&T with defense implications will already be known to that nation's Defense Department, and thus government-to-government cooperation is often the most appropriate route. World class S&T that the United States could gain access to through cooperation with a foreign nations' government should feature in the assessment.

The number of countries with which the United States could conceivably cooperate is wide-ranging, so it is necessary to prioritize our global assessment. The United States will not engage in cooperative S&T with our potential adversaries, so we should eliminate these countries from our assessment. (Knowledge of our potential adversaries' defense S&T capability is of course useful elsewhere in the U.S. DoD mission, but not for planning our cooperative engagements.) U.S. policy that limits or prohibits cooperation with certain countries must be taken into account. For example, through the National Defense Authorization Act (NDAA) for Fiscal Year 2000,¹⁴ Congress imposed strict limitations on military engagement with China – that the United States shall not “enhance their capabilities” – which governs the U.S. DoD's S&T interactions with China.

Instead, our global S&T assessment should prioritize nations with which we have an enduring defense commitment, whether bilaterally, regionally, or under a multilateral partnership such as TTCP and NATO. In addition, international policy may require us to consider countries with which we have no substantial relationship in order to develop new partnerships. To seek an assessment of every nation's defense S&T capabilities in equal measure is unnecessary and, therefore, prioritization is key.

Matters of technology protection should not preclude a nation's world-leading S&T from featuring in the assessment. Cooperative endeavors may be devised to facilitate U.S. access to foreign S&T without sharing our own protected technology in the same field, although this requires careful consideration during the setup phase. Any published advice from STP&E or a similar authority concerning certain sensitive technologies and country risks shall be taken into account in the prioritization.

¹³ <https://data.oecd.org>

¹⁴ <https://www.congress.gov/bill/106th-congress/senate-bill/1059>

1.3. UNDERSTAND REGIONAL COOPERATION DRIVERS

In addition to producing the demand signal for S&T, the CCMDs may also identify regional requirements for cooperation with specific nations to help achieve their mission objectives. These are expressed in the Country-specific Security Cooperation Sections (often referred to as “country plans” or “country cooperation plans”) of the CCMD’s Theatre Campaign Plan (TCP). JP 3-20 identifies International Armaments Cooperation (IAC) – of which S&T cooperation is a part – as one of several means through which security cooperation can be achieved. Depending on the theater and other factors, the CCMD may identify specific opportunities for cooperative S&T in a country plan, or may rely on Service or other Component input to formulate options for S&T cooperation and address interagency equities.

Interoperability with our allies is also an important consideration here, for although it concerns more than S&T alone, it imposes additional needs for S&T cooperation with select allied nations. In some cases, this manifests as specific S&T requirements for interoperability that we can use to direct our cooperative engagements. For others it is an operational need that may be met in part through closer S&T cooperation with specific partners. For example, the NSS outlines U.S. intentions to cooperate on missile defense with Japan and South Korea to develop an area defense capability that has ramifications for our S&T cooperation with those nations. Regional cooperation may also be driven by national and departmental international policy, such as initiatives to develop relationships with non-traditional defense partners.

Although not direct S&T needs, these drivers should influence the Component International S&T engagement Plan, specifically in the prioritization of nations to cooperate with.

1.4. UNDERSTAND FOREIGN S&T COOPERATIVE POTENTIAL

The opportunity to engage with a foreign government depends on more than just their preeminence in a technical field of interest to the United States. It also depends on their **willingness** or appetite to engage with the United States, their own **agenda** for S&T cooperation (if they have one), and the **ease** with which they can cooperate, including the existence of foundational bilateral security agreements. JP 3-20 characterizes this as their “*political will and capability for partnership*” and offers key questions to consider when evaluating cooperative potential.¹⁵

Some nations may refuse to cooperate with the United States or may impose limits on the extent of their interactions with us for reasons of their own national interests. In these instances, the United States may reciprocate their stance (in which case they would not feature in the global S&T assessment) but not always. For nations with no history of S&T cooperation with the United States we may explore the potential for S&T cooperation through initial discussions, albeit within the framework of U.S. policy and limitations thereof.

Our allies, foreign partners, and other nations with whom we may seek to establish a relationship may make clear their intentions and desired outcomes for defense S&T cooperation with us. Whether codified in formal documentation or known to us because of our pre-existing strategic or military relationship, their cooperative S&T priorities should feature in our assessment. It may be necessary to interpret these inputs or, depending on the maturity of the relationship, seek to influence them if they differ substantially from our own. Similarly, a partner’s ambitions might outstrip their capacity for international S&T cooperation and thus require a degree of judgment and/or exploration.

Conversely, a foreign government’s intentions and aspirations for S&T cooperation may not be readily apparent, especially during the formative stages of a relationship. This is an opportunity for the United States to steer cooperation towards that government’s national or defense S&T strengths, from which the United

¹⁵ Joint Publication 3-20 on Security Cooperation, III-12 (1), 23 May 2017

States would reap greatest benefit. In either case, the more mature the relationship, the more we may seek to influence the direction of the cooperation.

Lastly, we must consider the ease with which a foreign nation can facilitate international cooperation with us. Every nation is different, with varying legal, diplomatic and regulatory constructs for defense S&T, approaches to international engagement, and cultural norms. Although rarely insurmountable, these differences create complexity when negotiating cooperative agreements, requiring varying degrees of departmental effort and time to overcome. The presence of pre-existing framework agreements contributes to the ease of partnering with member nations, although this is not a prerequisite for cooperation. Ultimately, the ratio of time and effort to potential reward should be considered in the prioritization of international engagement goals. To meet our S&T needs it may be necessary to pursue short-term cooperative opportunities and more challenging, longer-term relationships in parallel.

1.5. ASSEMBLE THE INPUTS INTO THE PLAN

By mapping our knowledge of foreign S&T capability to our needs, priorities, and programs, and overlaying the factors affecting cooperation potential, we can identify where our international S&T efforts should be focused. The Plan itself need only contain: (a) a prioritized list of the specific S&T to pursue with specific nations; (b) a summary of current and planned international activities – the portfolio; and (c) the delta between these, i.e., the set of changes needed to align the portfolio to the priorities.

For small numbers of S&T priorities and foreign nations, this may be done qualitatively. In most cases however a quantitative approach may be necessary in order to effectively assimilate the inputs and determine where to focus effort. Figure 3 below provides an abstract representation of this process, using color intensity to depict quantifiable inputs.

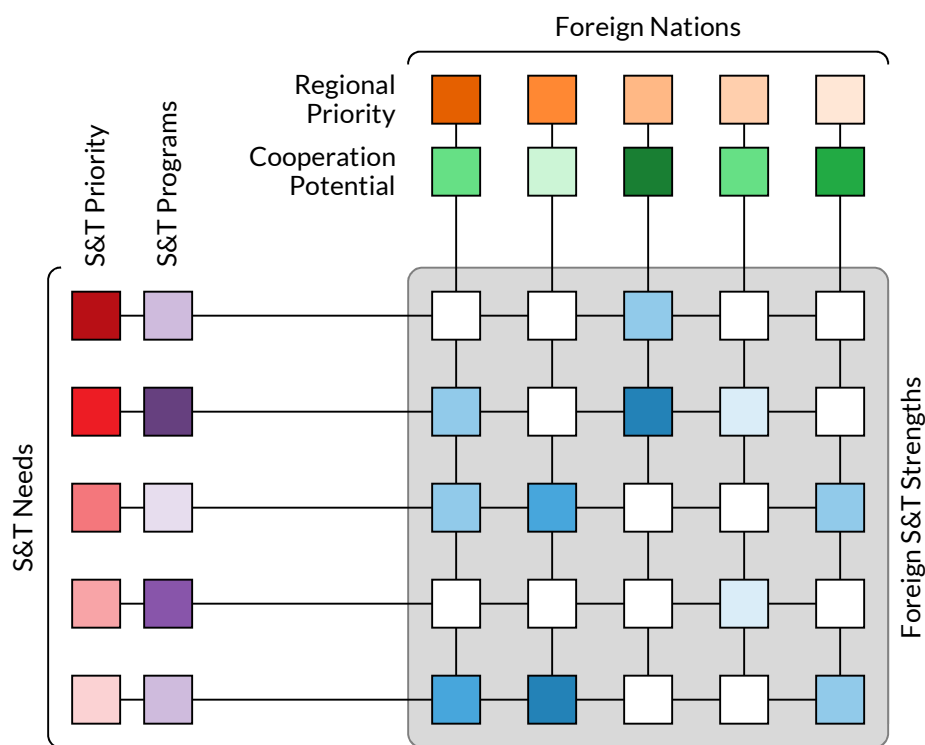


Figure 3 Abstract representation of the quantitative approach to integrate Plan inputs.

In this exemplar, the DoD Component's **S&T Needs** are listed in rows and sorted according to their priority. The **S&T Priority** may be quantified directly from the IPL/STIPL or inferred from contributing factors explored in 1.1. Adjacent to the S&T priority is a figure that represents the extent to which current or planned **S&T Programs** are expected to address the need, ranging from no impact to complete mitigation. This is necessary in order to compute the delta – the residual need – as well as identify where international cooperation could take advantage of established national programs.

The set of **Foreign Nations** to be considered – filtered according to the criteria in 1.2 – is then listed in columns and sorted according to any **Regional Priorities** for cooperation. Relative values for regional priority may be estimated based on the factors explored in 1.3. Adjacent to the regional priority is a figure that represents the foreign nation's **Cooperative Potential**, based on the factors described in 1.4. Unlike the other inputs introduced so far, a nation's cooperative potential should be invariant between Component Plans, and efforts should be made to ensure consistency.

At the intersection of S&T Needs and Foreign Nations, we indicate the **Strength** of the nation in that particular S&T field. This is not a derivative but another input to the assessment. Figures representing foreign S&T strengths may be estimated according to the sources described in 1.2. For this, and indeed for many if not all of the quantifiable inputs to the Plan, it may be convenient to assign discrete values, such as “low”, “medium” and “high” or similar. For the purposes of analysis these may be interpreted as 1, 2, and 3, respectively (for example). Not every intersection in every layer need be considered, although it may serve as a useful exercise to ensure completeness.

Pseudo-mathematically, we may then compute the relative priority for cooperation with a specific nation in a specific field of S&T as follows:

$$(\text{S\&T Priority} \div \text{S\&T Programs}) \times (\text{Regional Priority} \times \text{Cooperative Potential}) \times \text{Foreign S\&T Strength}$$

(Note that the extent to which S&T Programs address the need contributes inversely to the product as it is the residual *gap* that drives our demand for international S&T cooperation). By rank-ordering the results according to priority we create the prioritized list of the specific S&T to pursue with specific nations for inclusion in the Plan.

Our priorities for engagement may also be depicted at the intersection between S&T Needs and Foreign Nations, as another layer over the Foreign S&T Strengths. By comparing this set of **Engagement Priorities** with our **Current Engagement** portfolio, we can identify where the portfolio needs to be adjusted to better align with the priorities. Figure 4 provides an illustrative example of this concept as three additional layers on top of the matrix of Foreign S&T Strengths from Figure 3.

Quantitatively, by subtracting the Engagement Priority layer from the Current Engagement layer, we can identify where there are shortfalls and surpluses in the portfolio (depicted in shades of red and green, respectively, in Figure 4). This Engagement Delta may then be used to derive a prioritized list of changes required to bring the portfolio into alignment.

Through this approach we may optimize the international S&T portfolio to meet our residual S&T gaps, as well as achieve broader security cooperation objectives. It may be necessary to engage with multiple nations, either bilaterally or multilaterally, to fully meet an S&T need, especially where nations offer complementary capabilities. Such instances are prime candidates for multilateral engagement but this depends on the interrelationships between these nations as well as other factors.

This should not be a one-time activity, as our needs and priorities will evolve over time, as will the global S&T landscape and foreign cooperative potential. The Plan should be revisited at least every four years, or whenever U.S. defense strategy, international policy, or S&T priorities undergo significant change.

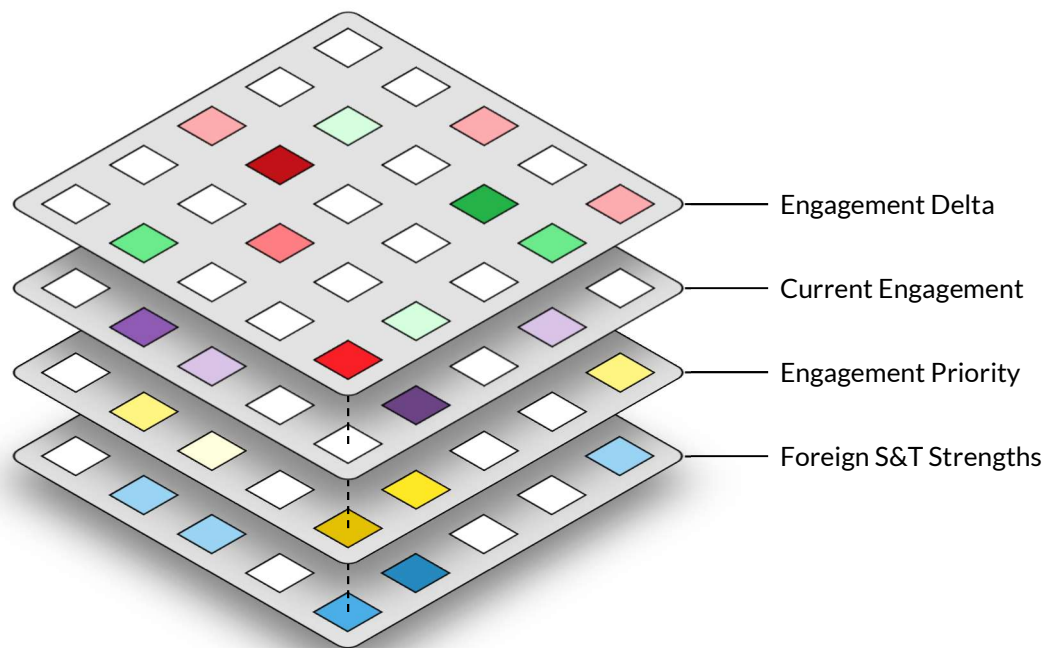


Figure 4 Abstract representation of engagement priorities, programs and the delta between them as layers above the matrix of foreign S&T strengths.

2. COORDINATE THE PLANS

Plans developed by DoD Components should be shared with other DoD Components performing international S&T cooperation in order to gain a **shared awareness of global sources of technology** and to coordinate plans. OSD, in particular, has a central role to ensure that the Department's S&T outreach is coordinated and presents consistent messages to our international partners, as the NDS directs. Within the OUSD(R&E), this function is performed by the International Outreach and Policy (IO&P) office. The Director, IO&P, will engage the community of Component Plan developers and stakeholders, and lead the coordination of Component Plans across the Department on behalf of USD(R&E).

Engagement priorities for each country or region should be collated to form a single coherent engagement plan per country/region. This establishes the strategic intent for S&T engagement with that country/region, as well as for multilateral cooperative agreements. It also helps identify where our S&T cooperation objectives are applicable jointly across DoD Components, where OSD assumes special interest. Where new partnerships are sought, OSD may assist DoD Components in developing a relationship or may take a lead role, especially where the new relationship is sought by multiple DoD Components. In certain cases OSD may be authorized to provide funding to support the exploration and development of cooperative relationships with new or non-traditional partners.

Particular attention will be given where foundational or broader framework agreements are needed to underpin the scope of cooperation sought. The time and effort required to develop foundational or overarching framework agreements to encompass cross-Component activities with one or more nations are

significant, but may be preferable to the cumulative effort to develop numerous, individual arrangements. Agreements that promote genuine partnership, enabling agile and responsive cooperation at pace (within the confines of statutory law), will be encouraged, to facilitate the shift away from purely transactional relationships. In so doing we will ensure that our **cooperative agreements are suitable and effective**.

By reviewing across Component Plans, any gaps in required S&T coverage across the globe may be identified, as well as any areas of significant duplication in our engagement priorities. (Where the United States relies on international cooperation to meet our S&T needs, it may well be appropriate to pursue multiple cooperative endeavors for deliberate redundancy.) By describing our Plans through a common S&T taxonomy and regional structure they may be more readily understood and integrated.

At this stage advice should be sought from the relevant technology security and foreign disclosure authority on any engagement priorities that are to be subject to technology protection limits or controls. This may necessitate coordination of disclosure policy between Components and potentially across United States Government departments, before sensitive information may be shared. Depending on the sensitivity of the technology and risks of cooperating with the nation(s) concerned, this may curb the degree of permissible cooperation or forbid it entirely, and the affected Plan(s) should be adjusted accordingly.

3. EXECUTE THE PLAN

This section provides guidance on how to execute the Plan within the DoD Component context, in four stages: understand the portfolio, transform the portfolio, design and implement the activities, and manage the engagements. The following subsections describe each of these stages in the order they appear in Figure 5.

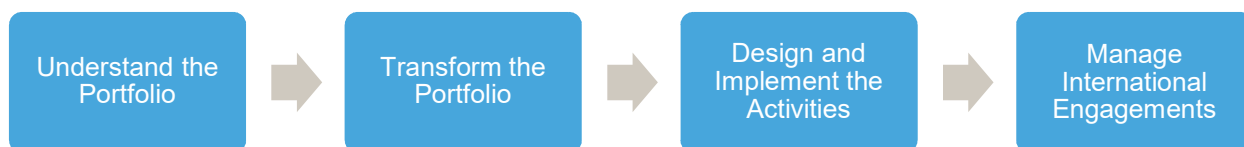


Figure 5 Sequence of activity to execute the Plan.

3.1. UNDERSTAND THE PORTFOLIO

To implement the Component Plan we must first understand how our international effort and resources are apportioned. Our portfolio of international S&T activity consists of: the relationships we maintain, the cooperative agreements we manage, the projects we engage in, and other components of cooperation including personnel exchange. This is a fluid, dynamic environment, with new relationships developing, agreements starting, altering and expiring, projects beginning and ending, and exchange personnel arriving and departing. Any snapshot of the portfolio is just that – a snapshot – which will rapidly deviate from reality unless updated, so it is important to review the portfolio regularly.

The quality of management information describing the portfolio is crucial. Often the metadata captured for Project Agreements (PAs) are insufficient to ascertain the specific activities taking place under them. It is necessary to know the specific S&T objectives of current and planned cooperative activity (ideally expressed via a common S&T taxonomy) and the participating U.S. DoD Components and foreign nations. This affords a meaningful comparison with the engagement priorities to determine how the portfolio should evolve to align to them.

3.2. TRANSFORM THE PORTFOLIO

If properly aligned, the activities of the portfolio should reflect the engagement priorities in the Plan. Where this is not the case, adjustments should be made to the portfolio. Resources may need to be redirected to address unmet needs in the Plan or bolster effort on high priority engagements. This may have implications for the S&T programs and budgets from which our international activity is funded. Our capacity to engage in international S&T cooperation is finite and limited by the resources available to us. We must use the engagement priorities outlined in the Plan to direct resources to the cooperative endeavors of greatest value to the United States.

We should not expect to transform the portfolio overnight; often, the desired changes will take time to implement. Relationships with new partners can take years to develop before supporting any substantial cooperative activity. Certain cooperative endeavors, in particular engagements with new partners or in hitherto unexplored fields of S&T, will likely require new cooperative agreements, which take time to develop.

Meanwhile, we may wish to taper or curtail our activity in certain fields or with certain partners where it is not aligned to the needs and priorities of the Plan. Such situations should be tackled carefully and diplomatically: we must not renege on our international commitments to our partners, even those with whom we envisage minimal return on investment. Instead, we should seek to redirect the relationship towards S&T objectives of greater value to the United States. Any proposals under consideration or plans in development that do not support the Plan should be deferred, albeit with discretion.

Similarly, we may need to endure through longer-term commitments before we can redeploy our resources to best effect. In both cases it is important to manage our partners' expectations, balancing candor and diplomacy as appropriate to our partners' intentions and cultures, and our interpersonal relationships. International cooperation is, after all, *cooperation*, and it may be necessary to compromise with our foreign partners to achieve partial success against our engagement objectives rather than none at all. The Plan describes our engagement priorities for international S&T cooperation, outlining our objectives and the scope for trades between priorities, to guide our negotiations with foreign partners.

3.3. DESIGN AND IMPLEMENT THE ACTIVITIES

The Plan not only indicates where resources should be directed, but should also inform the **depth** and **breadth** of any cooperative engagement.

International S&T cooperation can take a variety of forms, with varying degrees of depth. These range from fairly "shallow" engagements such as high-level government-to-government discussions, dialogues between researchers in public domain international conferences or symposia, and Information Exchange Agreements (IEAs), to much deeper cooperation such as jointly-funded collaborative projects and personnel exchanges. Figure 6 below depicts these activities on a spectrum of engagement depth.

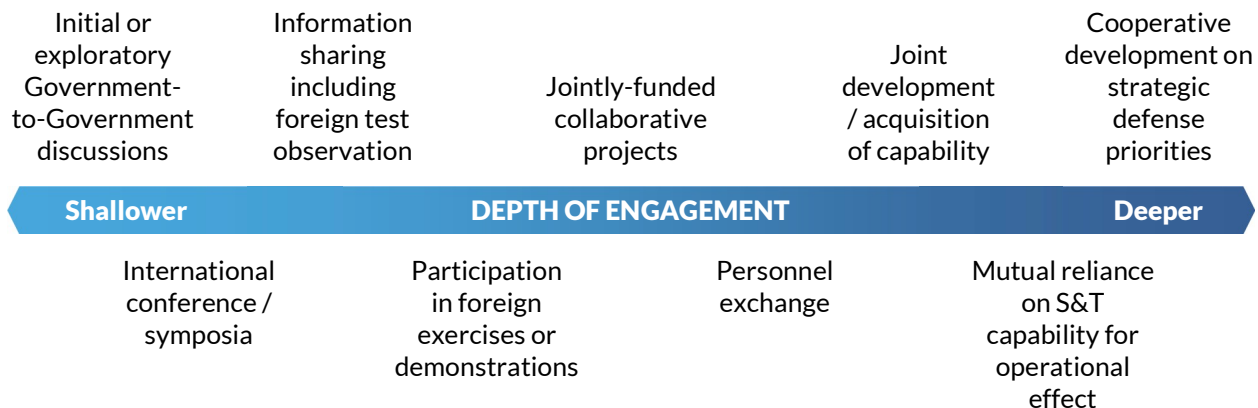


Figure 6 Spectrum of cooperation activities by depth of engagement.

The deeper activities typically produce outcomes of greater value that are more closely aligned to participants' interests, not least because these tend to involve a dedicated commitment of funds. However, the choice of cooperation type also depends on the maturity of the relationship and the desired outcomes of the cooperation. Shallower activities shall not be exclusively reserved for early stage or developing international relationships, since such activity may well be appropriate to established partnerships where deeper cooperation is not affordable or warranted by the Plan. Of course, the shallow options serve as excellent introductory activities with new partners and help to develop trust and pave the way for deeper cooperation in time.

Breadth concerns both the range of S&T topics in scope within a cooperative arrangement, and the number of participating nations. For long-standing multilateral partnerships such as TTCP and NATO, this is already well established. Here, the consequences of the Plan play out through dedicated governance systems (the TTCP Principals Meetings and NATO Steering Group, respectively), led by the nominated U.S. representative(s). In practice this must often be achieved tactically, by garnering support from member states to support U.S. S&T objectives.

Elsewhere we must develop bespoke arrangements in order to engage in meaningful cooperative activity, and we may be faced with a choice of whether to do so bilaterally or multilaterally. Bilateral cooperation is generally simpler as we need only concern ourselves with one partner; negotiations remain two-sided and we can typically reach an agreement rapidly, and with minimal compromise. Multilateral cooperation can be successful when all participating nations' interests, priorities, desired outcomes, budgets, and S&T competence are reasonably well aligned. It is not necessary for participants' S&T *capabilities* to align, as leveraging their unique S&T capabilities to deliver an outcome greater than the sum of its parts may well be the very purpose of the collaboration. However, the challenges associated with bespoke multilateral cooperation should not be underestimated, as the negotiation timescales and effort required scale exponentially with the number of partnering nations, and increase the prospect of compromise.

Where multilateral cooperation is sought it is important to consider the use of, and/or impact on, existing multilateral frameworks as well as bilateral relationships. There are several reasons that nations might choose to cooperate directly with one another, outside of the established alliance construct. These include lack of interest from other members, perhaps driven by affordability, or sensitivity over the S&T and/or its application. In such situations the United States and our allies should consider whether the work could reasonably be conducted under the auspices of the alliance before engaging in bespoke multilateral cooperation. Where permissible, this will substantially reduce the burden of setup and allow greater exploitation among our allies. If, instead, a new multilateral cooperation is justified, we must exercise diplomacy and avoid the creation of a consortium that excludes wider alliance membership. Such action may be perceived as hostile and may undermine the stability of our long-standing alliances.

Either way, it is important to understand what bilateral or multilateral arrangements or agreements already exist, to avoid unnecessary duplication. Where it is necessary to develop new bilateral or multilateral arrangements, these should be designed to encompass the totality of planned and potential cooperative work within defined boundaries, over the longest foreseeable lifespan. This affords flexibility in the cooperative work that may be conducted through the arrangement, enabling us to respond to reasonable changes in the Plan, and minimizes the overhead spent developing successive agreements. Framework agreements, affording dispensation to enact more specific cooperative projects rapidly as needed, should be considered for nations with which the United States has a particularly close defense S&T relationship. Such agreements often take longer to establish, but yield efficiencies in operation that could not be achieved through standalone project-specific agreements. Generally, a smaller number of broad and long-term arrangements is preferred over a larger number of shorter or more specific agreements.

Once the depth and breadth of a cooperation are established, detailed design, planning, and implementation may begin. While existing bilateral and multilateral relationships have well-established means of procedural engagement, for new partnerships it may be necessary for OSD to assume a leading role in the first instance, to initiate the first set of S&T discussions regarding technology modernization priorities, for example. Such discussions may involve the OUSD(R&E) Principal Directors or other technology-specific Subject Matter Experts (SMEs) brainstorming with their foreign counterparts to identify potential topics for future workshops. In turn, the outcome of those workshops may form a set of project proposals to be reviewed and approved by each nation's S&T leaders, thus leading to the initial stages of S&T cooperation.

This Strategy requires that international S&T cooperative agreements are formulated and managed in such a way as to ensure that outcomes are relevant and usable by the U.S. DoD. Moreover, statutory law and U.S. DoD policy require international agreements involving cost sharing to be *equitable*, meaning that **each nation's financial and nonfinancial contributions must be proportional to the benefits it receives**.¹⁶ A nation's declared contributions may constitute cash, researchers' time, previously-acquired information or materiel, use of facilities, or other in-kind contribution that adds value to the cooperation. The value of benefits to each nation – which may comprise information, technology, or indeed regional operational advantages – should feature in the calculation of equitability.

Although regional operational advantage is not formally recognized in the definition of equitability,¹⁶ it is an important consideration if we are to achieve **deliberate engagement**. Quantification of equitability factors that do not directly translate to financial figures is difficult but necessary to ensure the integrity of the planning process. Regional operational advantages will be particularly difficult to quantify, and simple metrics may need to be developed that relate to the Country Plan section of the relevant CCMD's TCP. To treat this as an afterthought, rather than as an integral component of equitability, risks undermining the systematic and objective planning process.

3.4. MANAGE INTERNATIONAL ENGAGEMENTS

The business of international S&T cooperation is enacted through our engagements with officials from foreign governments. This may comprise face-to-face meetings, telephone or video calls, and conferences, as well as written messaging. Face-to-face meetings are essential in the development of meaningful interpersonal relationships, which necessitates travel to foreign countries as well as hosting foreign visitors. Remote engagements can support the relationship and develop the cooperation more successfully when strong interpersonal relationships have been established, or when external events such as coronavirus disease 2019 (COVID-19) preclude international travel.

Our partners understand the role that senior leadership plays in directing our defense S&T organizations, shaping programs and empowering international cooperation. Indeed, some consider the extent of our

¹⁶ U.S. DoD 7000.14-R Department of Defense Financial Management Regulation, Volume 12 "Special Accounts, Funds and Programs," March 2019

leaders' engagement and quality of senior-level interpersonal relationships as indicative of the strength and depth of the government-to-government relationship. It is therefore important that our senior leaders are visible to foreign government officials at their level and that they are seen to be engaged in international S&T where appropriate. However, demand for senior leaders' time is high and Department business typically prohibits extended international engagements. We must therefore seek to maximize our leaders' impact on the international stage while minimizing the burden on their time.

Engagements between our senior leaders and foreign officials shall be strategically managed according to the coordinated Plans for international S&T cooperation. A visiting delegation should be welcomed by a U.S. DoD leader of appropriate rank or seniority, however briefly, to satisfy our partners' desire for senior-level engagement. Any expectations for extended engagement at that level, whether hosting foreign visitors or travelling to foreign nations, should be managed accordingly. Senior leaders may appoint an emissary to represent them and/or their organization when extended international travel is warranted. In this way, our senior leaders can be visible and demonstrate engagement in international S&T cooperation without unduly affecting their other responsibilities.

APPENDICES

LIST OF REFERENCES

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7. National Defense Science and Technology Strategy (September 2019)
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12. Strategic Engagement in Global S&T: Opportunities for Defense Research, National Academies Press (2014)

LIST OF DEFINITIONS

- **Components** (engaged in international S&T cooperation)
Comprises the Combatant Commands, the Military Services, and the Laboratories and Agencies within the Services and across the Fourth Estate.
- **Defense Science and Technology Enterprise**
The holistic community engaged in S&T for Defense, including the Department of Defense, global industry, global academia and foreign governments.
- **Fourth Estate**
The organizational entities of the U.S. DoD that are not part of the Combatant Commands or military Services. These include the Office of the Secretary of Defense, the Joint Staff, the defense agencies, and others.
- **International Science and Technology Cooperation**
All arrangements and activities between the United States and one or more partner nations concerning cooperative research, development, test and evaluation of defense technologies, systems or equipment. Excludes broader activities defined under International Armaments Cooperation including joint production and follow-on support of defense articles or equipment and procurement of foreign technology, equipment, systems or logistics support.

- **Research and Development**

Encompasses basic research, applied research, and advanced technology development (as per the definition of S&T) as well as demonstration and validation, engineering and manufacturing development, operational system development, and developmental and operational test and evaluation.

- **Science and Technology**

Encompasses basic research, applied research, and advanced technology development including prototyping and experimentation. Excludes system development and qualification, and other activities concerning acquisition and sustainment.

LIST OF ACRONYMS

A&S	Acquisition and Sustainment
AFC	Army Futures Command
AFOSR	Air Force Office of Scientific Research
ALT	Acquisition, Logistics and Technology
ASA	Assistant Secretary of the Army
ASN	Assistant Secretary of the Navy
CCMD	Combatant Command
COI	Community of Interest
CTO	Chief Technology Officer
CTTSO	Combating Terrorism Technical Support Office
DAO	Defense Attaché Office (DAO)
DARPA	Defense Advanced Research Projects Agency
DASA	Deputy Assistant Secretary of the Army
DEC	Defense Exports and Cooperation
DNI	Director of National Intelligence
DoD	Department of Defense
DTRA	Defense Threat Reduction Agency
FVEY	Five Eyes partner nations: Australia, Canada, New Zealand, the United Kingdom and the United States of America
IAC	International Armaments Cooperation
IC	International Cooperation
IEA	Information Exchange Agreement
IO&P	International Outreach and Policy
IPL	Integrated Priority List
ITC	International Technology Center
MDA	Missile Defense Agency
NATO	North Atlantic Treaty Organization

NDA	National Defense Authorization Act
NDS	National Defense Strategy
NDST	National Defense Science and Technology Strategy
NIPO	Navy International Programs Office
NSS	National Security Strategy
ODC	Office of Defense Cooperation
OECD	Organization for Economic Co-operation and Development
ONR	Office of Naval Research
ONRG	Office of Naval Research Global (international outreach branch of ONR)
OSD	Office of the Secretary of Defense
R&D	Research and Development
R&E	Research and Engineering
RDA	Research, Development, and Acquisition
S&T	Science and Technology
SAF/IA	Deputy Under Secretary of the Air Force for International Affairs
SME	Subject Matter Expert
STIPL	Science and Technology Integrated Priority List
STO	Science and Technology Organization (part of NATO)
STP&E	Strategic Technology Protection and Exploitation (an organization within OUSD(R&E))
TAPP	Technology Area Protection Plan
TTCP	The Technical Cooperation Program
USD	Under Secretary of Defense
WWII	World War II