March 2026

Defense Health Agency Strategic Research Plan: Sensory Systems



REVISION HISTORY

Revision	Entered by	Reason	Date
1	Kasey Moritz	Streamlined SRP hierarchy elements	March 2026

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1. OVERVIEW AND ORGANIZATION

The Defense Health Agency (DHA) Research and Engineering (R&E) Directorate leads the discovery and development of innovative medical solutions responsive to the needs of Combatant Commands, the Military Services, and the Military Health System (MHS). DHA R&E provides oversight and management of the Defense Health Program (DHP) Science and Technology (S&T) research budget to support priority medical research which includes the appropriation for research, development, test, and evaluation (RDT&E) Budget Activities (BA) 6.1-6.3 (Basic Research, Applied Research, Advanced Technology Development). The cornerstones of the DHA S&T management approach are as follows:

- Portfolio Managers directly accountable for the health and performance of their research Portfolios
- Alignment of research investments to validated medical capability gaps, operational requirements, and the needs of the Joint Force
- S&T efforts that focus on areas where DHP investments can make the most impact and accelerate delivery of knowledge and materiel products to product development and other transition partners or end users
- Informing multi-year program plans that allow adaptation to emerging (or declining) requirements

The DHA Deputy Assistant Director (DAD) for R&E employs Strategic Research Plans (SRPs) to inform and describe how Department of War (DoW) medical capabilities will be developed over time. SRPs are not investments plans but drive recommendations for Future Years Defense Program (FYDP) plans and serve as a critical tool for aligning investments with military medical health priorities. SRPs include information that will enable the Portfolio Manager to perform the following activities:

- Develop, on an annual basis, the FYDP plans in alignment with SRPs and anticipate the resources that will be required for the respective Program Objective Memorandum (POM) cycle
- Provide the oversight and concurrence of Year of Execution (YOE) spend plans that Program Managers (PMs) will be responsible for developing as a recommendation to the Portfolio Manager
- Facilitate discussion with leadership (e.g., DHA and Assistant Secretary of Defense – Health Affairs) and stakeholders regarding the research activities required to address Capability Requirements

The following DHP S&T criteria apply to scope for inclusion in an SRP and associated SRP-based S&T program planning:

- Medical research providing knowledge or materiel products relating to preventing, stabilizing, preserving, repairing, and/or resolving diseases or injuries affecting service members across military operational environments
- Medical research addressing Joint MHS capability requirements or gaps
- Research that is operationally relevant, transition oriented, traceable to clinical practice, informs military doctrine, and/or informs health or product development

Research areas that do not meet these criteria and are excluded from SRPs include:

- Human performance enhancement (beyond baseline)
- Medical surveillance
- Non-research infrastructure maintenance
- Healthcare policy assessments
- Personal protective equipment/weapon systems evaluation
- Non-medical Military Occupational Series (MOS) training
- Clinical practice implementation science

SRPs are organized into four levels:

- **Capability Areas (CAs)** reflect the highest structural elements that encompass broad areas of medical research within an SRP
- **Capability Requirements (CRs)** are derived from key source documents (e.g., Joint Capabilities Integration and Development System – JCIDS) and outline Capabilities (knowledge or materiel) required to meet current or future military medical needs
- **S&T Paths (STPs)** describe the high-level research activities needed to support the transition of Capabilities to product development, other transition partners, or end users
- **Capabilities** describe the S&T knowledge and/or materiel products to be transitioned to product development or end users

Figure 1-0 shows the hierarchical relationship between the components of the SRP with the associated reference schema. Modality is displayed as the lowest level of the hierarchy for ease of organization.

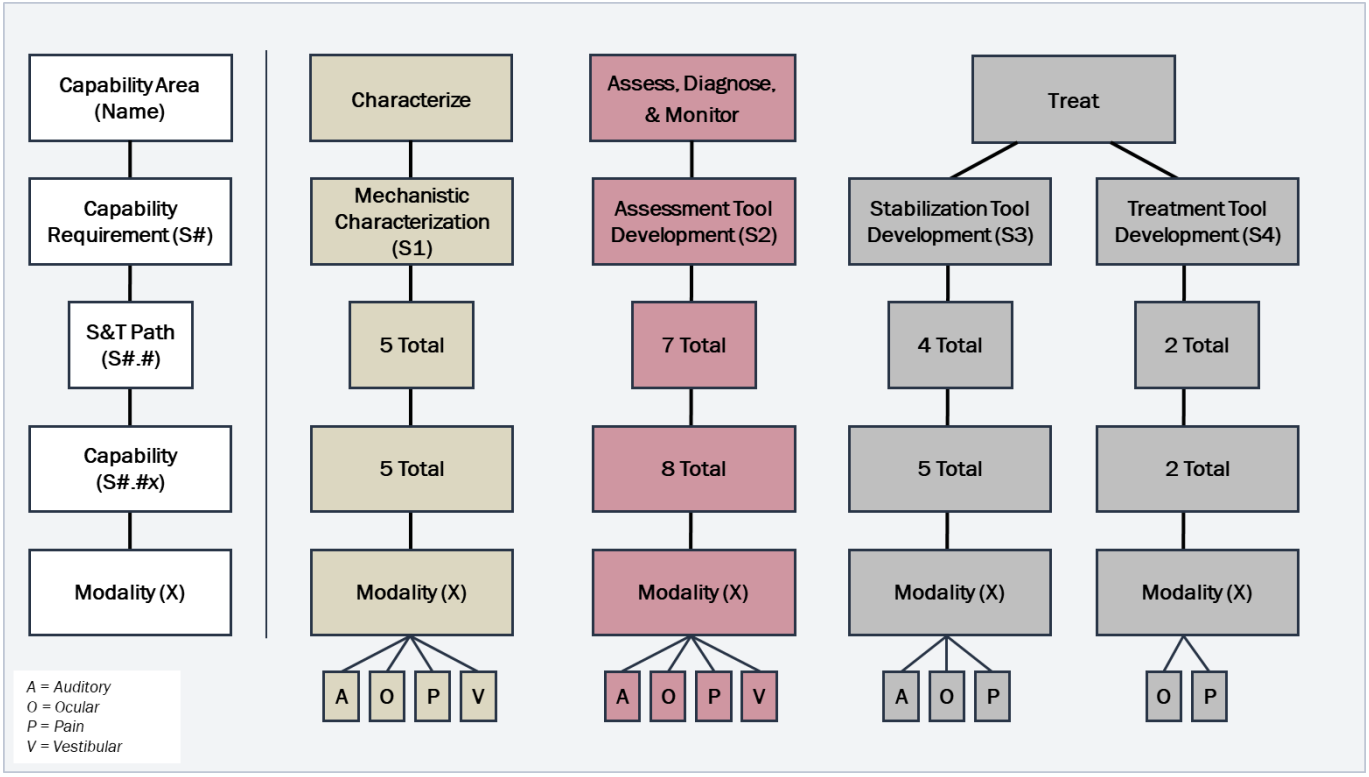


Figure 1-0 SRP Hierarchy

The scope of the DHA Sensory System SRP includes CRs relating to injury or illness to sensory systems including research to characterize basic mechanisms and to advance assessment, diagnosis, monitoring, and treatment. These CRs serve the overall goal of maintaining unit and individual readiness, preserving operational effectiveness, and accelerating return to duty. SRPs only outline the CRs deemed as priorities. These priorities have been identified based on assessment of the current and future medical and operational needs and/or existing research gaps of the military medical community. Inclusion of a CR in the SRP does not guarantee that funding will be aligned to its respective STPs or Capabilities. Prioritized CRs are organized into 3 major CAs, as shown in Table 1-0.

Table 1-0 Capability Areas Included in the SRP Iteration

Capability Area	Capability Area Description
Characterize	Characterize mechanisms and risk factors for sensory injury or illness [2,4,8]
Assess, Diagnose, Monitor	Develop practices or tools that aid diagnosis of sensory injury or illness, assess the health of sensory systems, and develop return to duty standards [2-6,8,11]
Treat	Provide treatment for sensory injury or illness at/near the point-of-injury (POI), in-transit, and acute care [1-6,8,9]

The sensory system is naturally organized into modalities, each with a diverse array of specialized receptors designed for transducing external stimuli into electrochemical signals. Each modality is finely tuned to detect and encode specific sensory information, with subsequent neural processing and interpretation of these signals culminating in the perception and comprehension of the external environment. For this reason, the DHA Sensory Systems SRP differs from others in that it utilizes a 5th level of organization (Sensory Modality), which encompasses

multiple distinct components of sensory medical S&T research. This level of organization allows for distinctions between the prioritized elements (CA, CR, STP, and Capability) of each sensory modality. Within the SRP, the umbrella terms *Auditory (A), Ocular (O), Pain (P),* and *Vestibular (V)* are used to describe all components of a sensory modality (see Appendix E for full definitions).

The prioritized CRs are listed in Table 1-1, with each priority CR denoted via an S number (i.e., S1, S2, S3, S4). Section 2 describes the STPs leading to defined Capabilities for each CR. It is important to note that this numeric labeling schema (S1 – S4) is not meant to represent relative priority and is simply intended to logically organize the CRs for ease of use.

Table 1-1 Capability Requirements Included in the SRP Iteration

S#	CR Name	Capability Requirement Description
S1	Mechanistic Characterization	Develop improved models of sensory injury or illness, describing the etiology, mechanism(s), progression, and potential targets for prevention [2,4,8]
S2	Assessment Tool Development	Develop knowledge and materiel solutions for diagnosing and quantifying sensory injury or illness (in clinical testing and operationally relevant function) [2-6,8,11]
S3	Stabilization Tool Development	Optimize stabilization solutions and point-of-injury care of sensory injury to preserve function and readiness [1-6,8,9]
S4	Treatment Tool Development	Develop knowledge and materiel solutions for the repair or mitigation of sensory injury or illness [2-5,9]

2. CAPABILITY REQUIREMENTS AND ASSOCIATED S&T PATHS

This section outlines the CRs, the detailed STPs that describe research activities associated with CRs, and Capabilities expected to transition to product development or other end users (e.g., members of the clinical and/or operational communities) to fulfill the CR. The Capabilities represented will transition to product development or other end users when they reach the appropriate technology or knowledge readiness level (TRL or KRL). Product development will then perform, as appropriate, additional development activities required to mature these Capabilities for clinical or operational use by the intended end user. Each of the sensory modalities and their respective CRs, STPs, and Capabilities, are graphically depicted as follows:

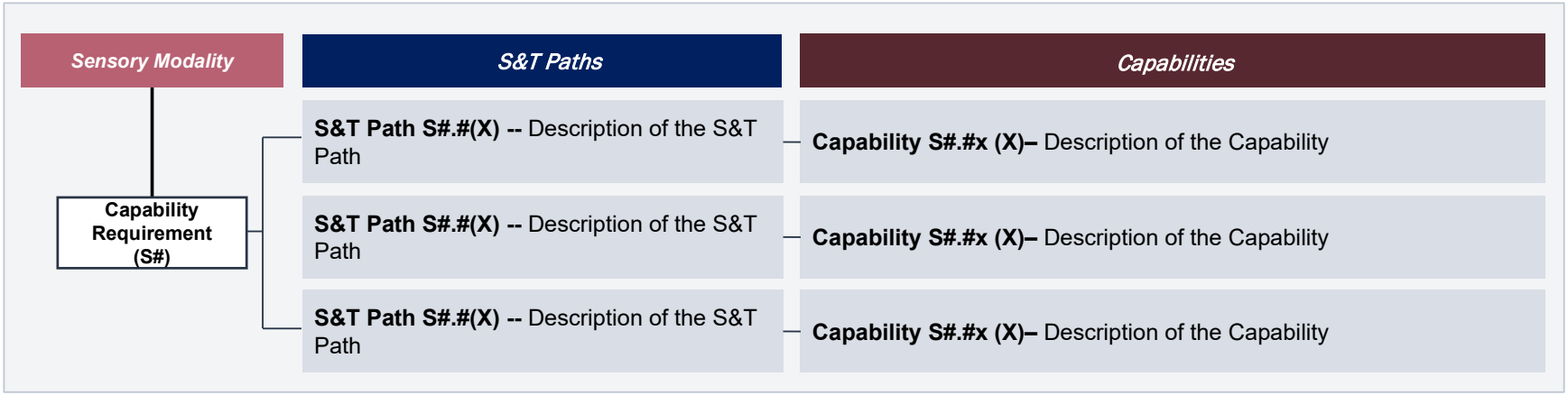


Figure 2-0 Modality Graphic Example

The CRs, STPs, and Capabilities outlined in this section focus on addressing DoD-specific, validated joint-service medical S&T needs. The SRP is limited to activities that are unlikely to be resolved through S&T activities outside of the DHA—specifically, where military exposures or injuries are unique, or where potential solutions may differ from or not be adequately addressed by efforts elsewhere. Similarly, Capabilities of shared interest that are being pursued by other, non-DHA entities (e.g., Veterans Affairs, National Institutes of Health) were not included as a priority in the SRP. Finally, modalities of sensory research that have little, if any, direct applicability to DoD needs (e.g., smell, taste) were not included in the SRP. Inclusion as a priority was determined through input from DoD stakeholders and other federal agency partners, as well as analysis of the Research Landscape (RL).

2.1 Auditory (S1)

The Auditory CRs focus on the critical operational need to maintain lethality, command, and control. A warfighter who cannot hear commands or detect threats is a liability, so our mission is to deliver capabilities that mitigate this risk. To achieve this, the CRs deliver a balanced combination of knowledge and material solutions:

- S1 (A) addresses the limited understanding and science of battlefield hearing loss [2,4,8]. It delivers predictive models and threat assessments that define how enemy, friendly fire, and training damage hearing, which directly informs the development of advanced testing platforms to accelerate the discovery of mission-relevant treatments.

- S2 (A) addresses specific military relevant needs related to prehospital injury and return to duty assessments that can be utilized for post-blast auditory issues, alongside ruggedized, objective diagnostic tools that a medic or similar responder can use during or shortly after combat in operational environments [2-6,8,11].

- S3 (A) delivers solutions to stabilize acute auditory injury to preserve combat effectiveness in a combat or prehospital environment [1-6,8,9]. It encompasses point-of-injury treatment protocols and decision aids that guide medics' actions, as well as novel pharmacological agents and stabilization devices designed to halt damage and initiate recovery.

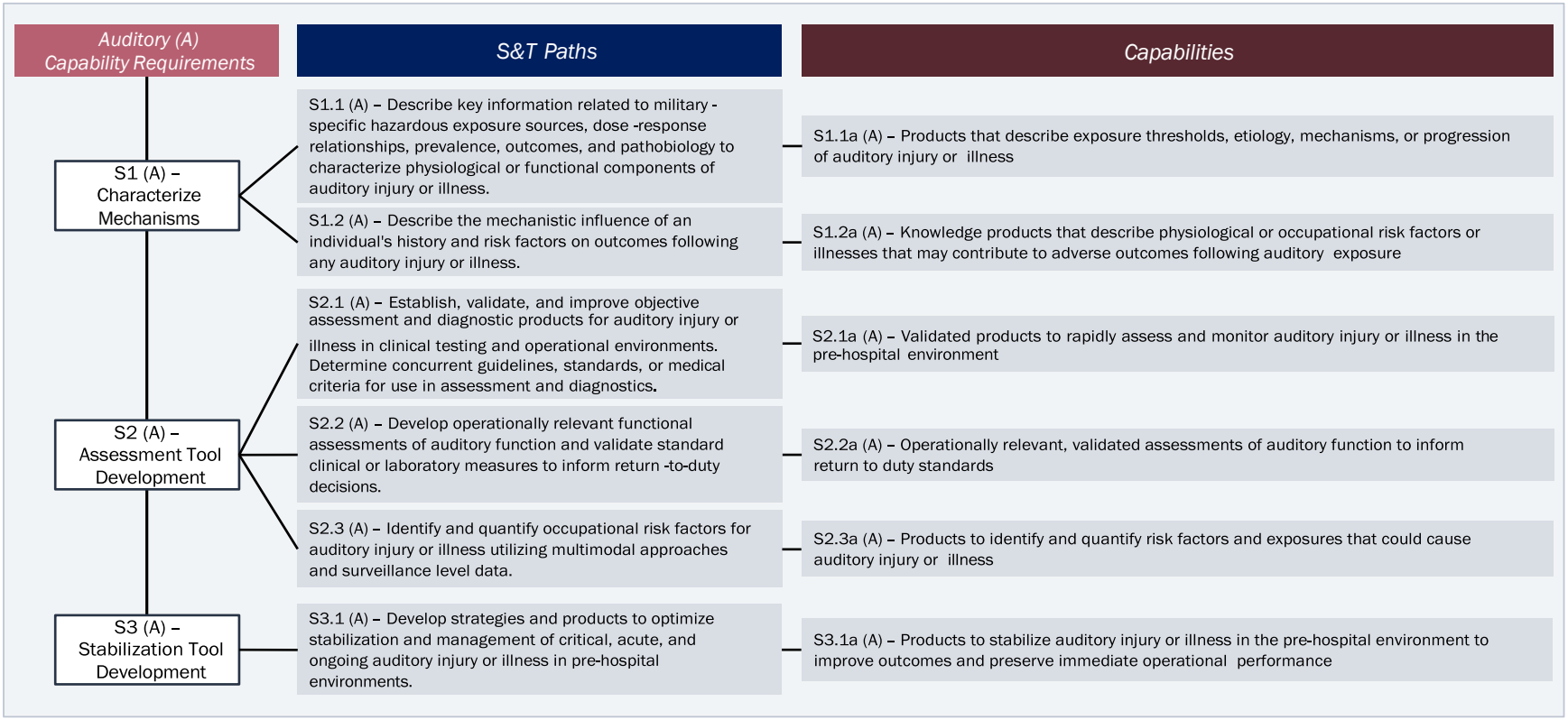


Figure 2-1 Auditory Capability Requirements, S&T Paths, and Capabilities

2.2 Ocular (S2)

The Ocular CRs focus on the urgent military need to save sight and restore visual function following combat trauma. The ability to return a warfighter to the fight, or preserve their quality of life, depends on rapid and effective interventions at the point of injury and across the continuum of care. The CRs deliver a balance of knowledge products and materiel solutions to achieve this mission:

- S1 (O) addresses the science of battlefield eye trauma. It delivers threat-based injury models and predictive analytics that define how blast, emerging threats, and penetrating trauma damage the eye, which directly informs the development of advanced, human-like tissue models for testing novel therapeutics [2,4,8].

- S2 (O) delivers the means to make rapid, accurate diagnostic decisions in austere environments, including return to duty standards and decision support. This is achieved through the dual development of evidence-based triage protocols and tele-medicine guidance for remote expert consultation, alongside portable, high-resolution imaging devices that provide far-forward responders with the data needed for critical interventions [2-6,8,11].

- S3 (O) delivers solutions to protect and stabilize acute ocular injuries to maintain operational effectiveness in a combat or prehospital environment. It encompasses point-of-injury treatment doctrine and CPG updates for far-forward providers, as well as next-generation eye shields and advanced topical therapeutics designed to halt damage and prepare the eye for surgical repair. [1-6,8,9].

- S4 (O) addresses the treatments needed to preserve and repair visual function following the type of acute ocular injuries that are most likely to occur in a military environment [2-5,9].

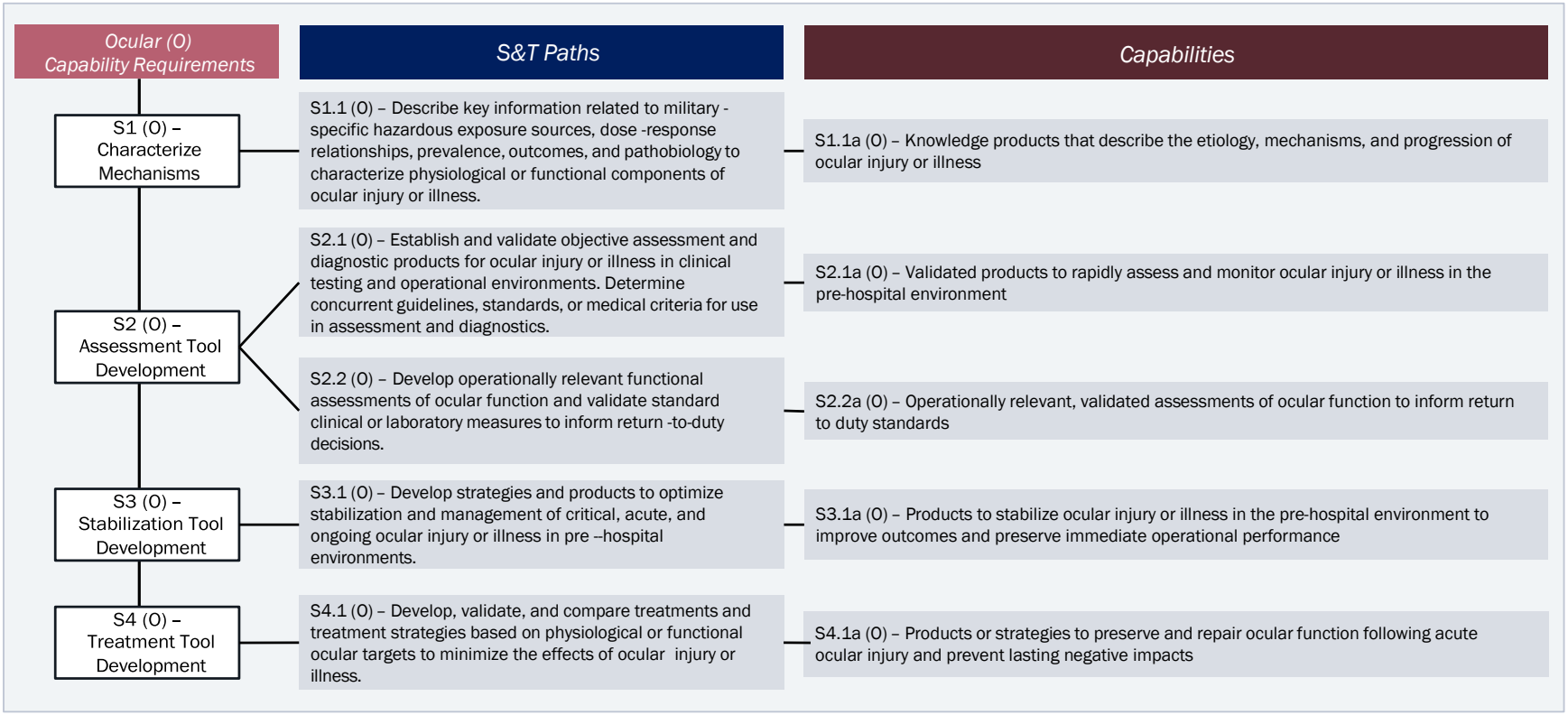


Figure 2-1 Ocular Capability Requirements, S&T Paths, and Capabilities

2.3 Pain (S3)

The Pain CRs focus on the critical military requirement to control combat pain without compromising warfighter lethality. A warfighter incapacitated by pain, or cognitively impaired by traditional analgesics, is a mission liability. Our objective is to deliver solutions that keep our warfighters in the fight and enable advanced trauma care. The CRs deliver a balance of knowledge products and materiel solutions to achieve this mission:

- S1 (P) addresses the science of military trauma. It focuses on characterizing the pathophysiology of pain related to military service to deliver predictive models of pain, chronic pain development, and identify at-risk individuals. Success here will directly inform the development of advanced human-based platforms for testing the efficacy and safety of next-generation, non-addictive analgesics [2,4,8].

- S2 (P) delivers the means to move beyond subjective pain scales to objective assessment, particularly in instances that may hinder return to duty. This is achieved through the dual development of evidence-based standards for pain-related return to duty determinations, alongside the validation of objective biomarkers and portable diagnostic tools that quantify a warfighter's true pain state [2-6,8,11].

- S3 (P) delivers capability solutions to control prehospital pain. It encompasses new clinical protocols that guide medics' actions, as well as the development of novel, non-degrading analgesics designed to maintain a warfighter's cognitive function and combat effectiveness [1-6,8,9].

- S4 (P) addresses pain control products for use in an operational environment where support staff and other resources may be limited, such as a field hospital or mass casualty event. It delivers data-driven treatment algorithms and decision aids for managing multiple casualties, supported by next-generation, easy-to-use battlefield anesthetics and pain control devices that reduce the burden on medical staff [2-5,9].

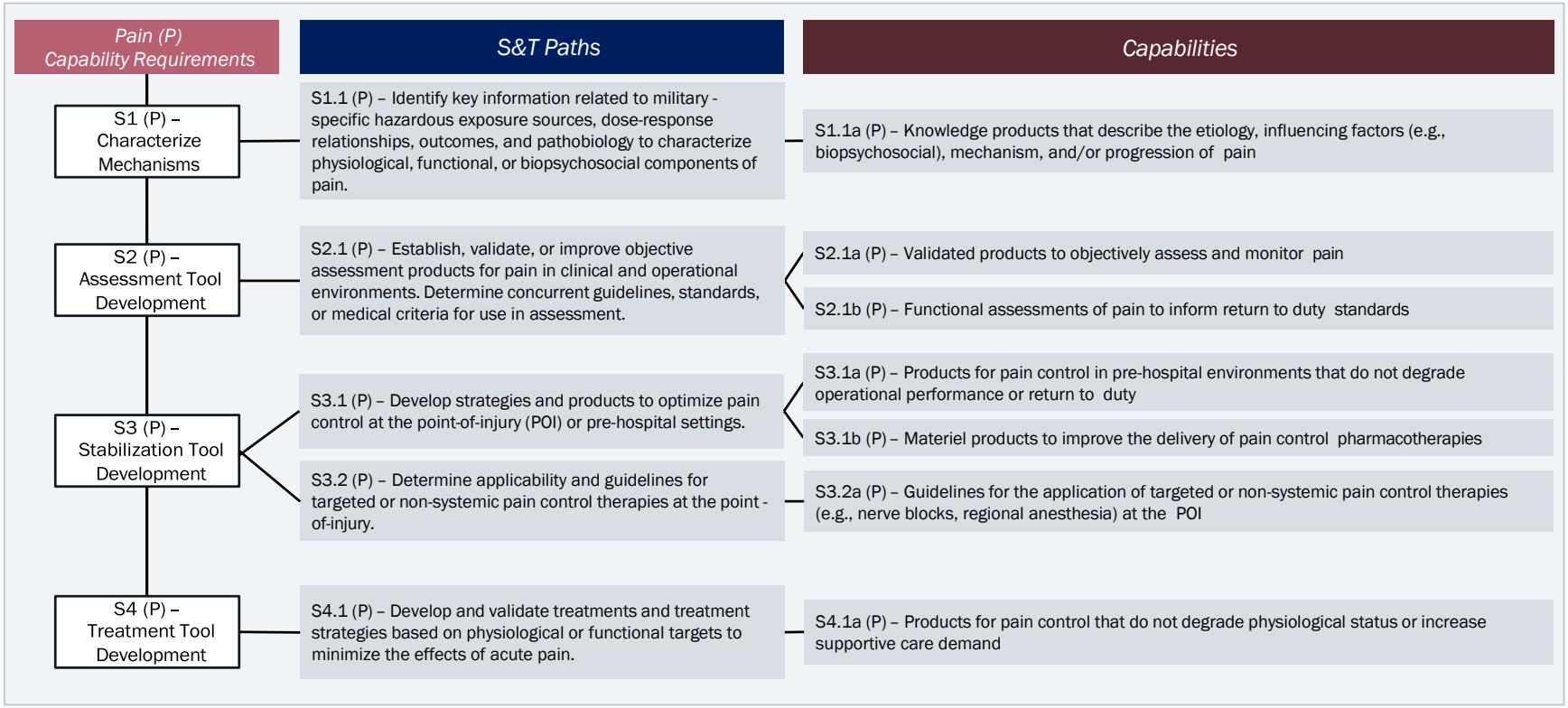


Figure 2-2 Pain Capability Requirements, S&T Paths, and Capabilities

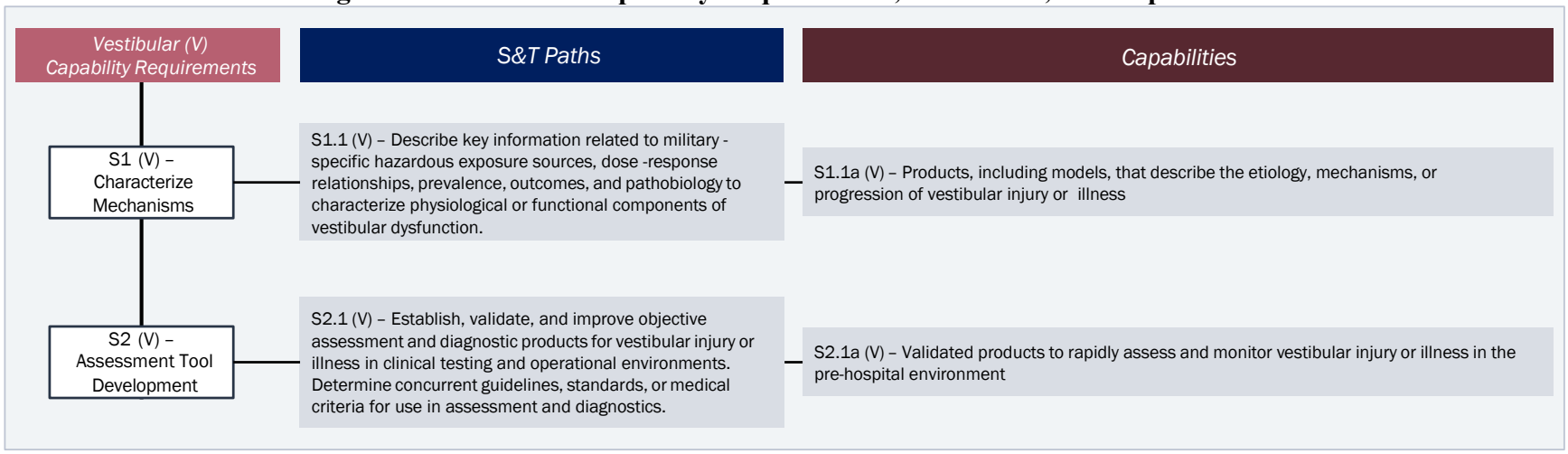
2.4 Vestibular (S4)

The Vestibular CRs focus on the critical military need to maintain warfighter balance, spatial orientation, and mobility after combat exposures. A service member suffering from dizziness or disorientation cannot navigate complex terrain, operate advanced platforms, or accurately engage a target. S1 (V) addresses capabilities intended to better describe the underlying biophysical mechanism(s) of military relevant vestibular injury [2,4,8]. S2 (V) focuses on products to rapidly assess vestibular injury in a prehospital operational environment [2-6,8,11].

- S1 (V) addresses the science of battlefield dizziness and imbalance. It delivers predictive injury models that define how blast and other components of combat exposure disrupt the vestibular system, which directly informs the development of advanced platforms to accelerate the development of validated assessment and monitoring tools.

- S2 (V) delivers the capability to rapidly quantify vestibular dysfunction at the point of need. This is achieved through the dual development of evidence-based standards for post-exposure return-to-duty decisions, alongside clinical guidance and/or portable, objective assessment tools that a medic can use to quickly screen for mission-critical imbalance in the field

Figure 2-3 Vestibular Capability Requirements, S&T Paths, and Capabilities



3. REFERENCES

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[3] Deputy Assistant Secretary of Defense, Force Health Protection & Readiness, “Initial Capabilities Document for Department of Defense Combat Casualty Care Devices and Products,” December 30, 2014.

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[14] U.S. Department of Defense, “2022 National Defense Strategy of the United States of America”. October 27, 2022.

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APPENDIX A. KEY DEFINITIONS

Term	Definition
6.1	Budget Activity (BA) for Basic Research increases knowledge/understanding: discovery; hypothesis testing. ~TRL 1–2
6.2	Budget Activity (BA) for Applied Research is the refinement of concepts into solutions: pre-clinical studies; drug formulation; device defined in animal model. ~TRL 2–3
6.3	Budget Activity (BA) for Advanced Technology Development is candidate solution development; proof of concept and product safety demonstrated (e.g., Phase 1–2a trials). ~TRL 3–6
Auditory	Term used to represent the entire auditory system and hearing-related functions it enables, from basic sound perception to complex speech comprehension
Budget Activity	Categories within each appropriation and fund account that identify the purposes, projects, or types of activities financed by the appropriation or fund
Capability	The S&T knowledge and/or materiel products to be transitioned to product development or other end users
Capability Area	Reflect the highest structural element that encompasses broad areas of medical research within a Portfolio
Capability Requirement	Derived from key source documents, and outline capabilities (knowledge or materiel) required to meet current or future military medical needs
Interdependency	Reliance of 1 S&T progression on the outcome of another or more S&T activities
Joint Capabilities Integration and Development System	JCIDS is the process by which the military develops and validates capability requirements for joint (more than 1 Service) use and interoperability
Long-Term Rehabilitation	The potential capability to enable long-term rehabilitation of injured or wounded warfighter and mitigation of long-term and late effects that limit the RTD
Medical Readiness	Ensuring warfighters are healthy, protected from potential threats, and ready for operations or contingencies
Military Community	Warfighters, DoD civilians, and beneficiaries
Modality	The component or type of sensory research applicable to each Capability Area, Capability Requirement, S&T Path, and Capability
Multisensory	Relating to 2 or more of the senses within the scope of the DHA Sensory Systems Portfolio
Ocular	Term used to represent the entire visual system and functions it enables, from basic visual perception to complex target identification

Term	Definition
Operational Effectiveness	The ability of an individual warfighter, unit, or force to successfully conduct its assigned tasks and accomplish its mission
Research Gap/S&T Gap	The lack of science and technology research activities identified through the Research Landscape
SME	An individual who has accumulated great knowledge in a particular field or topic
S&T Path	Describe the high-level research activities needed to support the transition of Capabilities to product development or other end users
Vestibular	Term used to represent the sense of balance, to include proprioception, touch, and spatial orientation

APPENDIX B. ACRONYMS

A	Auditory
AHP	Analytical Hierarchy Process
BA	Budget Activity
BUMED	United States Navy Bureau of Medicine and Surgery
CCCRP	Combat Casualty Care Research Program
CDMRP	Congressionally Directed Medical Research Program
CR	Capability Requirement
CSI	Congressional Special Interest
DAD	Deputy Assistant Director
DARPA	Defense Advanced Research Projects Agency
DHA	Defense Health Agency
DHP	Defense Health Program
DoD	Department of Defense
DOERS-IH	Defense Occupational & Environmental Health Readiness System – Industrial Hygiene
EGS	Electronic Grants Systems
FY	Fiscal Year
FYDP	Future Years Defense Program
GDF	Guidance for the Development of the Force
ICD	Initial Capabilities Document
JCIDS	Joint Capabilities Integration and Development System
JSS	Joint Staff Surgeon
KRL	Knowledge Readiness Level
MED CDID	Medical Capability Development Integration Directorate

METC	Military Education and Training Campus
MHS	Military Health System
MOMRP	Military Operational Medical Research Program
NEI	National Eye Institute
NIDCD	National Institute on Deafness and Other Communication Disorders
NIH	National Institutes of Health
NRAP	National Research Action Plan
O	Ocular
P	Pain
PM	Program Manager
POI	Point-of-Injury
POM	Program Objective Memorandum
R&E	Research and Engineering
RL	Research Landscape
RPMD	Research Program Management Division
RTD	Return to Duty
S&T	Science and Technology
SME	Subject Matter Expert
SRP	Strategic Research Plan
STEID	Science & Technology Enterprise Integration Division
STPMB	Science & Technology Portfolio Management Branch
STPM	Science & Technology Portfolio Management
TBI	Traumatic Brain Injury
TRL	Technology Readiness Level
USAF/SG	Office of the United States Air Force Surgeon General

USAMMDA	United States Army Medical Materiel Development
USAMRDC	United States Army Medical Research and Development Command
USSOCOM	United States Special Operations Command
USUHS	Uniformed Services University of the Health Science
V	Vestibular
VA	Veterans Affairs
WBH	Warfighter Brain Health
YOE	Year of Execution