National Security Science & Technology Strategy

August 2026

Appendix A: Critical and Emerging Technologies List Update

Critical and emerging technologies (CETs) are a subset of advanced technologies that are or may become critically important to U.S. national security. This is a narrower focus than listing all technologies relevant or even important to national security. Each identified CET area includes a set of subfields that illustrate its scope but are not meant to be comprehensive. Relevant departments and agencies should include, within their R&D activities, a dedicated focus on maintaining U.S. leadership in identified CET areas, and within national security S&T should prioritize their application toward supporting and enabling national security objectives.

Advanced manufacturing and materials

- Advanced additive manufacturing beyond prototyping, especially for metals, ceramics, and large-scale structures
- Smart manufacturing and use of digital threads and digital twins
- Nanomanufacturing
- Materials by design utilizing AI and autonomous development and production
- High entropy alloys
- Advanced composites and lightweight metals
- Materials with novel, tailored, and improved properties, including biomaterials and substitution of rare-earth or critical minerals-based alloys with earth-abundant minerals

Artificial intelligence (AI) and autonomy

- Perception, recognition, and sensor fusion
- Planning, reasoning, and decision-making
- Robotics and embodied intelligence
- Foundation models, including large language, multimodal, and world systems
- Multi-agent systems and swarm intelligence
- Autonomous systems for surface, air, maritime, space, and cyber domains
- Autonomous command and control
- Autonomous agent identification and authentication
- Interpretability and control
- Adversarial robustness and AI security
- Techniques to enable next-generation AI systems, such as continual learning
- Distributed and privacy-preserving machine learning

Biotechnology

- Novel synthetic biology including nucleic acid synthesis; genome and epigenome engineering; protein design, synthesis, and engineering; and computational modeling
- Engineering of sub-cellular, multicellular, multi-scale, cell-free, and viral systems
- Novel therapeutic design and manufacturing
- Biotic/abiotic interfaces and novel materials
- Biomanufacturing and bioprocessing technologies
- Neurotechnologies

Communications and networking

- Future generation wireless networks
- Optical links and fiber technologies
- Spectrum access technologies
- Software-defined networking and radios
- Modern data exchange techniques
- Adaptive network controls
- Resilient and path-diverse communications, including delay-tolerant and infrastructure-independent networking, adaptive waveforms, and space and stratospheric modalities

Directed energy

- Lasers
- High-power microwaves
- Particle beams

Future computing technologies

- Advanced and next-generation computing architectures
- Photonic, neuromorphic, and other non-Von Neumann computing modalities
- High-performance supercomputing, including for AI applications
- Edge computing and devices for tactical environments
- Brain-computer interfaces
- Enabling technologies for high security computing
- Hardened operating systems for consumer use
- Advanced spatial computing

Hypersonics and advanced missile technologies

- Propulsion
- Aerodynamics and control
- Materials, structures, and manufacturing
- Testing
- Detection, tracking, characterization, and defense

Information management and cybersecurity

- Data management, including storage and security
- AI-enabled and autonomous cyber capabilities
- Distributed ledger technologies and digital assets
- Digital identity technologies and biometrics
- Computing supply chain security and assurance
- Communications, network, and cyber-physical systems security
- Post-quantum cryptography
- Operational technology and industrial control system security and resilience

Nuclear energy

- Advanced fission reactors
- Fusion energy

- Space nuclear power and propulsion systems
- High-temperature and radiation resistant materials

Positioning, navigation, and timing (PNT)

- Diversified PNT-enabling technologies for airborne, space-based, terrestrial, subterranean, and underwater settings
- Interference, jamming, and spoofing detection
- Disruption/denial-resisting and hardening technologies
- Chip-scale frequency standards, inertial sensors, and atomic clocks

Quantum information technologies

- Quantum computing
- Quantum sensing
- Quantum communications and networking
- Enabling components, algorithms, materials, and fabrication techniques

Semiconductors and microelectronics

- Design automation tools
- Advanced manufacturing process technologies and equipment
- Beyond complementary metal-oxide-semiconductor (CMOS) technology
- Heterogeneous integration and advanced packaging
- Specialized hardware components for AI, RF and optical applications, elevated radiation environments, high-power devices, and other critical applications
- Novel materials for advanced microelectronics, including 2D materials
- Microelectromechanical and Nanoelectromechanical systems (MEMS and NEMS)
- Integrated photonics

Sensing and signature management

- Advanced sensors and sensor systems, including distributed apertures
- Data processing and fusion
- Adaptive optics
- Detection and characterization of pathogens and of chemical, biological, radiological, and nuclear weapons and threat materials

Space technologies

- Cost-effective on-demand and reusable space launch
- Advanced space vehicle power generation and propulsion
- Novel space vehicle thermal management
- Access to and use of cislunar space and novel orbits
- In-space aggregation and assembly
- Biotechnologies for space applications
- Crewed spaceflight enablers

Appendix B: Alignment of Critical and Emerging Technologies with Priority National Security Needs

Critical and emerging technology (CET) areas support and enable elements of the NSSTS. Most have significant implications that are readily apparent in the current security environment. In some cases (denoted by parenthesis in the table below), specific implications have yet to emerge but are on the horizon.

Critical and Emerging Technology Areas	*Maintain and advance U.S. technological advantage on the battlefield*			*Protect the homeland and deny strategic advantage to adversaries*				*Lead in trans-formative ET*
	Space; Air; Long-range strike	Under-sea	Nat. sec. AI & auto-nomy	Border sec.	Nuclear deter-rence; Missile defense	Cyber def.	BW def.	
Advanced manuf. & materials	✓	✓			✓		✓	
AI & autonomy	✓	✓	✓	✓	✓	✓	✓	✓
Biotechnology				✓			✓	✓
Communications & networking	✓	✓	✓	✓	✓	✓		
Directed energy	✓				✓			
Future computing	✓	✓	✓	✓	✓	✓	✓	
Hypersonics & advanced missiles	✓		✓		✓			
Information security & cybersecurity	✓	✓	✓	✓	✓	✓	✓	
Nuclear energy	✓	✓			✓			
Quantum information	(✓)	(✓)			(✓)	(✓)		✓
PNT	✓	✓	✓	✓	✓	✓		
Semiconductors & microelectronics	✓	✓	✓	✓	✓	✓		
Sensing & signature management	✓	✓	✓	✓	✓	✓	✓	
Space technologies	✓	✓	✓	✓	✓	✓		

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