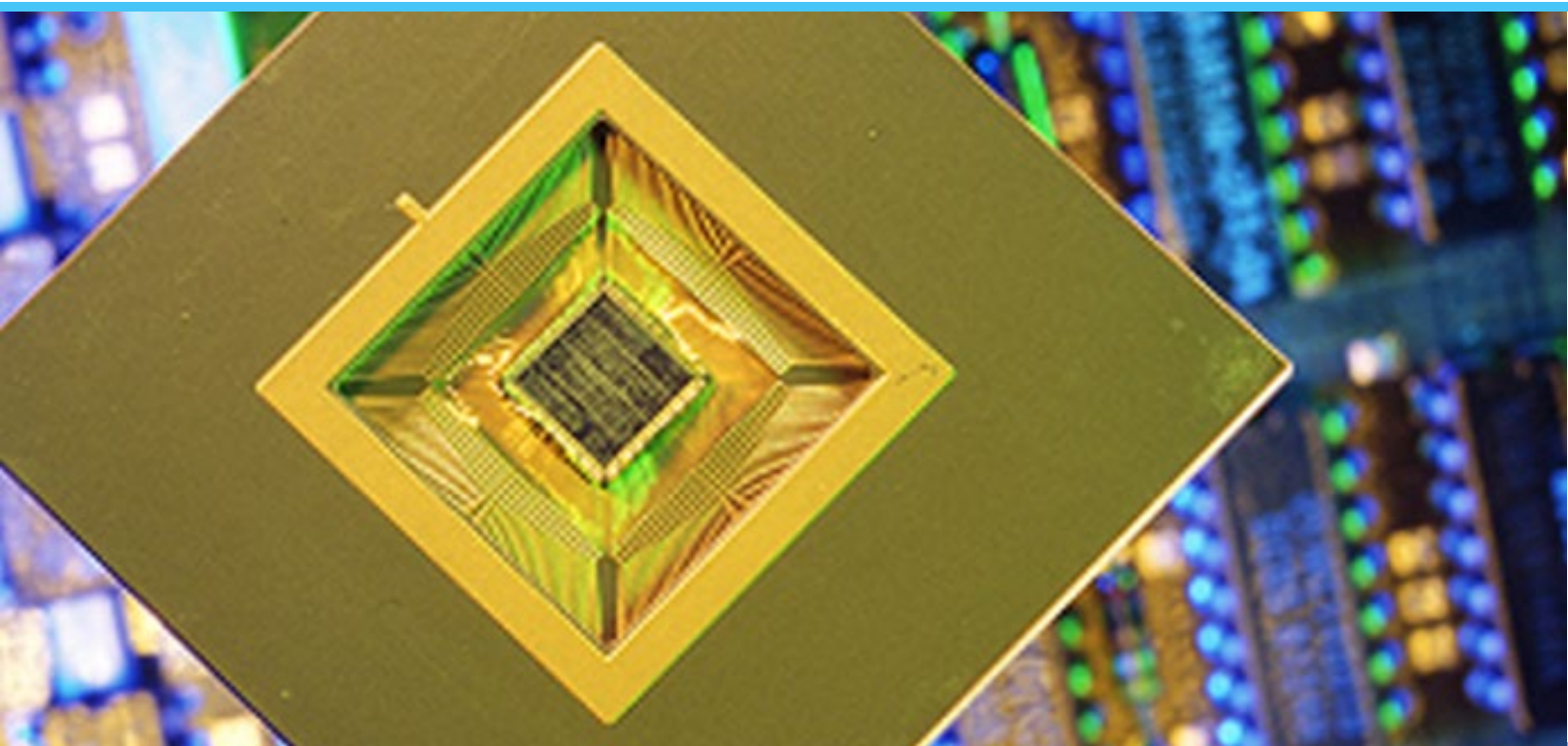




U.S. DEPARTMENT OF DEFENSE

Microelectronics Vision

May 2022



FOREWORD

Microelectronics (ME) are ubiquitous and essential to national and economic security. The Department of Defense (DoD) needs guaranteed access to measurably secure ME that meet our current and future systems requirements. Of particular importance to DoD are the ME that provide the Warfighters' edge, delivering effective and secure communication systems, superior military weapon systems, and systems that comprise the United States (U.S.) strategic deterrent.

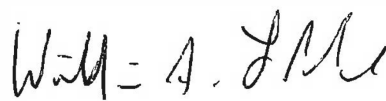
Recognizing the importance of increasing efficiency and minimizing vulnerabilities within the Department's ME supply chain, the Deputy Secretary of Defense established the Defense Microelectronics Cross-Functional Team (DMCFT) in January 2021. One of the DMCFT's key responsibilities is to develop a DoD-wide ME strategy that includes an implementation and transition plan for a sustainable U.S. ecosystem using the best commercial design, development, operation, sustainment, and modernization practices. The Department is at a pivotal moment where it must take advantage of the national interest and funding in ME by developing a unifying vision and strategy to ensure national security equities are met. This document is the DMCFT's recommendation for a whole-of-DoD vision to inform DoD senior leaders and the broader community. As the DMCFT gathers data on and analyzes the current state of ME to develop the corresponding implementation and transition plans, this vision document may be refined or updated.

The DMCFT has completed a vision for ME consisting of seven interconnected objectives. A number of government and industry subject matter experts contributed to this strategy and we want to thank them for their contributions.



Heidi Shyu

Under Secretary of Defense for
Research and Engineering



William A. LaPlante

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VISION

INTRODUCTION

Over the past two decades, the Department has sponsored many studies to develop insight and recommendations related to ME challenges. A complete review of these studies is beyond the scope of this document, but in summary:

- ME are ubiquitous and essential to national and economic security.
- The U.S. military advantage depends on ME to create and sustain technological superiority (e.g., ME provide Warfighters an edge by powering systems for effective and secure communication, superior military weapons, and the U.S. strategic deterrent) (see Figure 1).
- ME drive the critical timelines for current and future DoD warfighting capability.
- The Department is increasingly dependent on foreign sources for ME manufacturing.
- DoD is unable to change the current trend of developing new systems that provide a linear increase in warfighting capabilities due to ME, but result in an exponential increase in development, sustainment, operational, and modernization costs.

In response, the DMCFT has developed a central vision statement for the Department:

DoD will obtain and sustain guaranteed, long-term access to measurably secure microelectronics that enable overmatch, increased operational availability, and support Warfighter combat readiness.

“

“The Department will continue to invest in programs to secure U.S. microelectronics interests; reverse the erosion of domestic innovation and supply; and establish a strong foundation for the next generation of microelectronics technology for DoD applications, while also sustaining current systems.”

Lloyd J. Austin III
Secretary of Defense

COMMUNICATIONS



SMART-T Communications



Secure Mobile Handheld Device

WEAPONS



Modular Advanced Armed Robot System



F-35 Lightning II & USS Zumwalt

DETERRENCE



Ballistic Missile Submarine



Intercontinental Ballistic Missile System

Figure 1: Examples of ME Applications

OBJECTIVES

To achieve this vision, the DMCFT recommends the adoption of the following strategy consisting of seven interconnected objectives:

- Ensure timely access to measurably secure and affordable ME technology.
- Motivate programs and their primes to modernize and exploit the most capable ME.
- Leverage tools, policies, and enforcement to reduce or eliminate costly sustainment issues.
- Centralize knowledge in a DoD “front door” organization to augment decentralized execution.
- Increase ME discovery and innovation, and accelerate transition into DoD systems.
- Contribute to and influence interagency and national efforts to grow ME capabilities to meet national security needs.
- Cultivate a workforce with the right capacity and the right skills at the right place and the right time.

Each objective is critical, and to succeed, the Department will need to collaborate and coordinate with other U.S. departments and agencies; the intelligence community; Congress; the Executive Office of the President; the defense industrial base, including the ME industry; and academia.

No prioritization of the objectives is intended. However, in the development of implementation and transition plans, the DMCFT places priority on the “now” (i.e., actions affecting existing programs and near-term Warfighter combat readiness and operational availability).

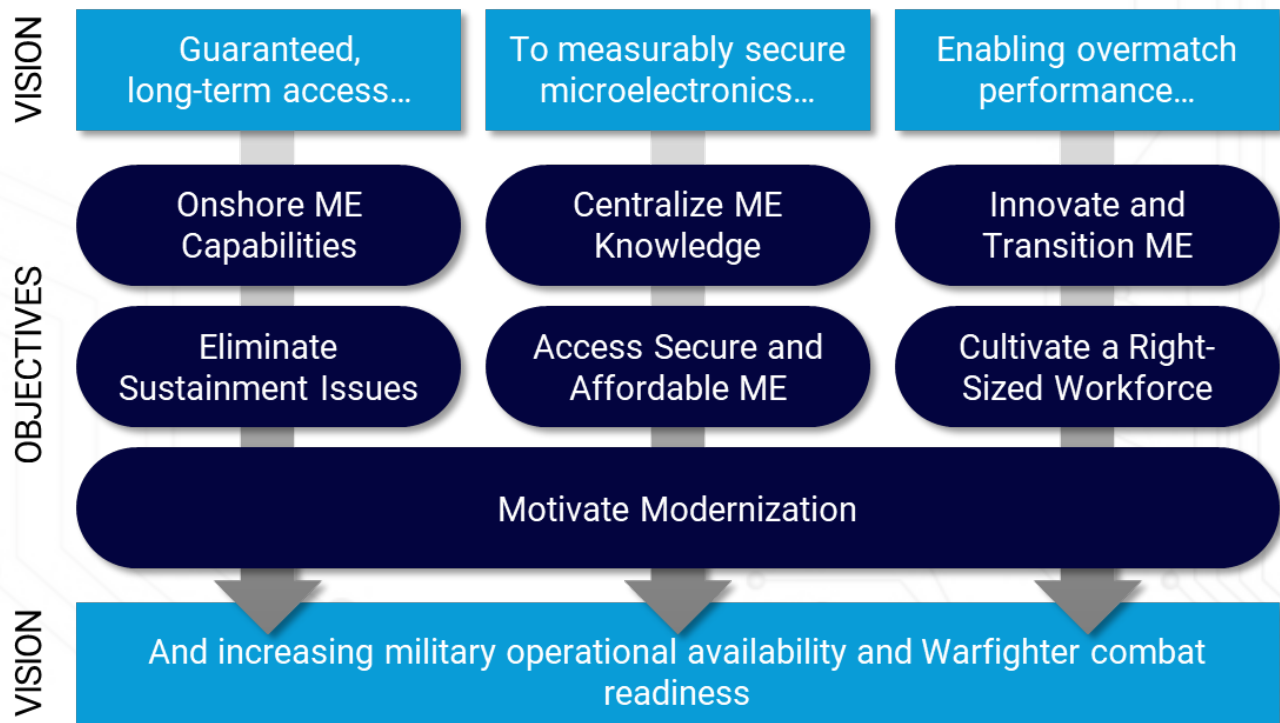


Figure 2: ME Objective Alignment

Increase ME Discovery and Innovation, and Accelerate Transition into DoD Systems

Worldwide discovery and innovation have driven remarkable gains in ME capabilities. The Department's science and technology (S&T) portfolio is a tangible contributor that has and will continue to provide breakthroughs relevant to DoD and broader industry needs. The Department will need to continue investment in S&T, and develop innovative methods for efficient transition into programs to produce technological superiority and Warfighter advantage.

Centralize Knowledge in a DoD “Front Door” Organization to Augment Decentralized Execution

Currently, the Department has both decentralized knowledge and decentralized execution of ME use. Centralizing ME knowledge and best practices will substantially increase the Department's ability to aggregate purchases, increase influence on the market and technology roadmaps, improve part selection and management, standardize policies and practices, and forecast needs to minimize the negative impacts of diminishing manufacturing sources and material shortages (DMSMS) issues. A cross-Department effort will establish a centralized organization to manage ME knowledge and support programs of record.

Contribute To and Influence Interagency and National Efforts to Onshore ME Capabilities

The Nation is motivated to invest significantly in onshoring more ME capabilities to promote both national and economic security. These investments include both those which the Department has full discretion, and those which the Department is a key stakeholder (e.g., funding where other government agencies are the investment lead). The Department will actively participate with interagency partners in developing strategic investments for a strong and vibrant domestic ME capability focused on national security.

Leverage Tools, Policies, and Enforcement to Reduce or Eliminate Costly Sustainment Issues

U.S. weapons systems' long development cycles and operational lifetimes far exceed the production lifetime of nearly all ME components. ME obsolescence, as well as the difficulty and cost associated with technology refresh and system redesign, force the Department into expensive lifetime buys or reliance on suspect gray market ME. A full review of the current state of tools, policies and enforcement, and digital engineering¹ capabilities will define the baseline from which courses of action will be defined and implemented.

¹ Department of Defense, Office of the Deputy Assistant Secretary of Defense for Systems Engineering, “Department of Defense Digital Engineering Strategy, June 2018..

Ensure Timely Access to Measurably Secure and Affordable ME Technology

The Department's ME needs are broad, spanning many generations and types of technology. The Department requires affordable and timely procurement of secure commercial-off-the-shelf (COTS) ME and unique government ME designs across this vast span. This must be achieved while also protecting the underlying DoD information, and providing a spectrum of security options to effectively manage risk. By defining and enforcing standards and processes for procuring measurably secure parts, the Department will mitigate serious risk along the ME supply chain.

Cultivate a workforce with the right capacity and the right skills at the right place and the right time.

ME expertise is rare, especially for clearable U.S. citizens. Although the Department has numerous islands of excellence with deep expertise in areas of ME research, design, acquisition, and sustainment (e.g., simulation and digital twinning, parts selection, DMSMS management, etc.), demand for such talent is growing and competition with industry is increasing. In addition, many of DoD's experts are retirement-eligible, creating risk to the existing talent base. DoD will reinforce a skilled workforce pipeline that will accelerate ME technology adoption and development of the necessary engineering expertise required to sustain the national need for the future.

Motivate Programs and Primes to Modernize and Exploit the Most Capable ME

The Department plans to invest \$112B in Fiscal Year 2022 (FY22) on research, development, test and evaluation, and more in the out-years on nuclear systems, space and cyberspace, intelligence, surveillance, reconnaissance and other communications, and missile defense that will significantly increase U.S. overmatch versus great power competitors.² However, as the 2018 National Defense Strategy states, "success no longer goes to the country that develops a new technology first, but rather to the one that better integrates it and adapts its way of fighting." As such, DoD will ensure that programs and primes have the resources, motivations, and know-how to utilize relevant ME technologies, processes, standards, and support.

² Vergun. "DoD Budget Request Boosts Research, Nuclear Modernization and Includes 2.7% Pay Raise," DoD News, May 2021.

NEXT STEPS

Using this vision as a framework, the DMCFT is developing an implementation and transition plan as part of the Department's program and budgeting process, influencing both FY23 and FY24 program builds. The DMCFT will identify approaches and resourcing requirements to meet the objectives in the implementation plan, which will also incorporate all ME-related DoD strategy documents and policy guidance. As part of the transition plan, the DMCFT will provide a mapping of implementation responsibility to specific individuals, program offices, or relevant government entities, and a timeline for handover following the disbanding of the DMCFT. Through FY22, this strategy document will be updated as the DMCFT illuminates the Department ME baseline and gathers input from key stakeholders.



The semiconductor-based integrated circuit is the “DNA” of technology and has transformed essentially all segments of the economy, from agriculture and transportation to healthcare, telecommunications, and the Internet. The semiconductor industry is a major engine for U.S. economic growth and job creation. Semiconductors are used in virtually every technology product and underpin state-of-the-art military systems.

The White House
*100-Day Reviews under
Executive Order 14017*

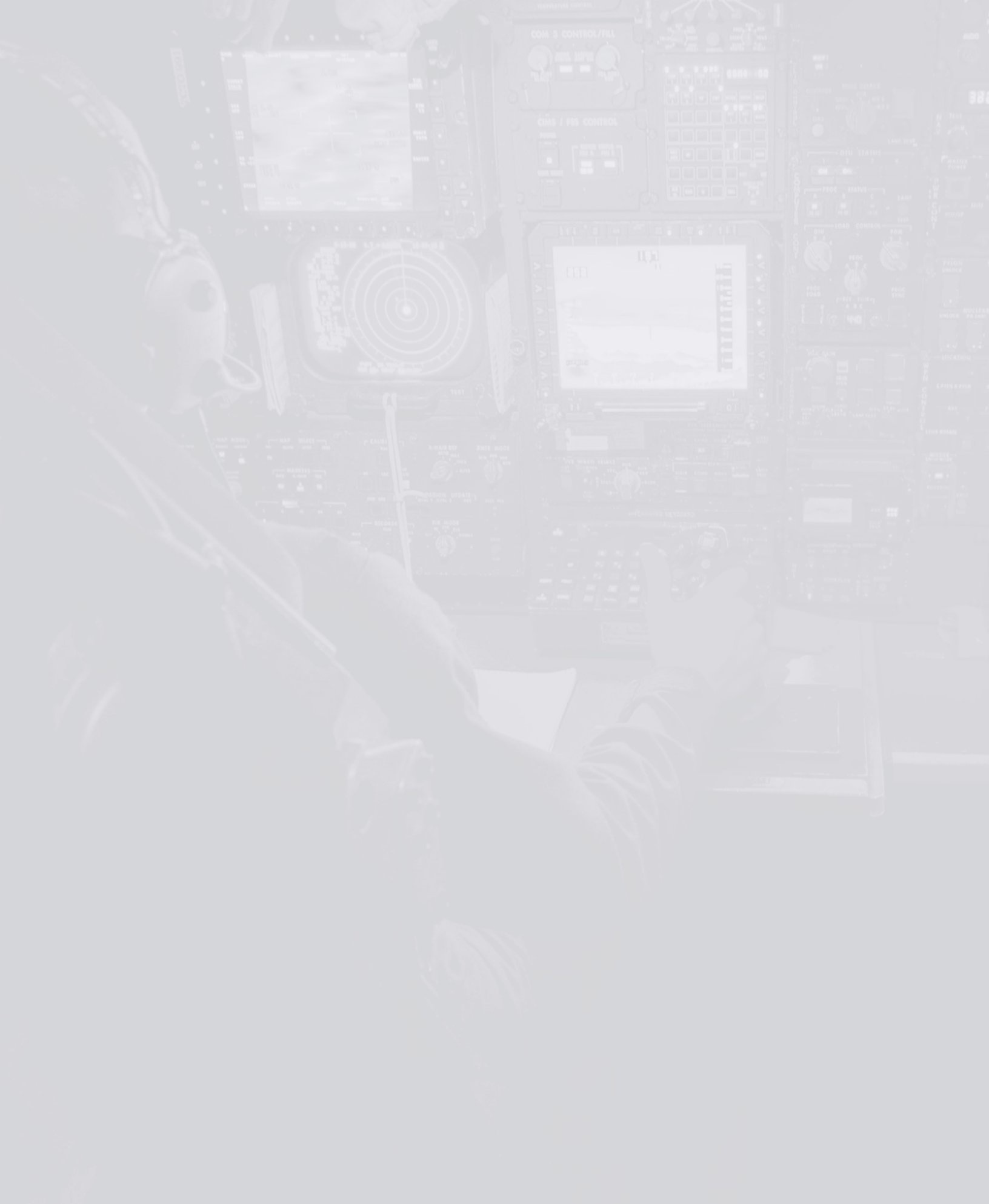
SUMMARY

The Department is at a pivotal moment where it must take advantage of the national interest and funding in ME by developing a unifying vision and strategy that ensures we meet our national security equities. ME is a critical enabler for the combat readiness of U.S. Warfighters; it is foundational to every program and system developed, fielded, and sustained by DoD. With advanced technology in a joint all-domain operational environment expected to increase our warfighting capabilities, ME is pivotal in achieving and delivering this future state. In this document, the DMCFT recommends a vision composed of seven major objectives to ensure DoD ME superiority over the coming decades. This vision provides the framework to develop an implementation and transition plan for execution.



“Critically, we reallocate resources to fund research and development in advanced technologies, such as microelectronics. This will provide the foundation for fielding a full range of needed capabilities, such as hypersonic missiles, artificial intelligence, and 5G.”

Dr. Kathleen Hicks
Deputy Secretary of Defense





United States Department of Defense
Defense Microelectronics Cross-Functional Team

