

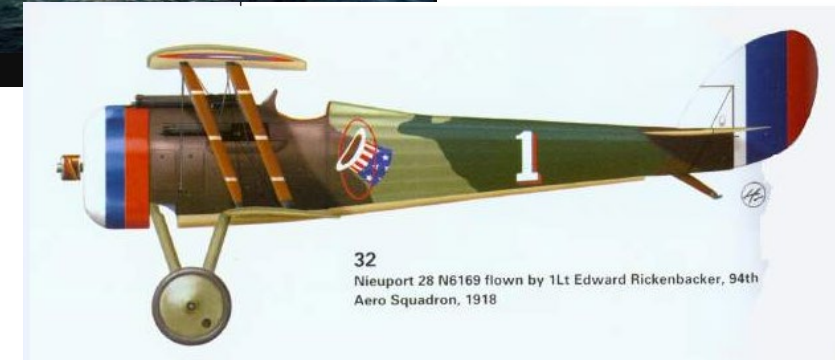
# **Emerging Technologies and the Future of Defense**

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# Lessons from History

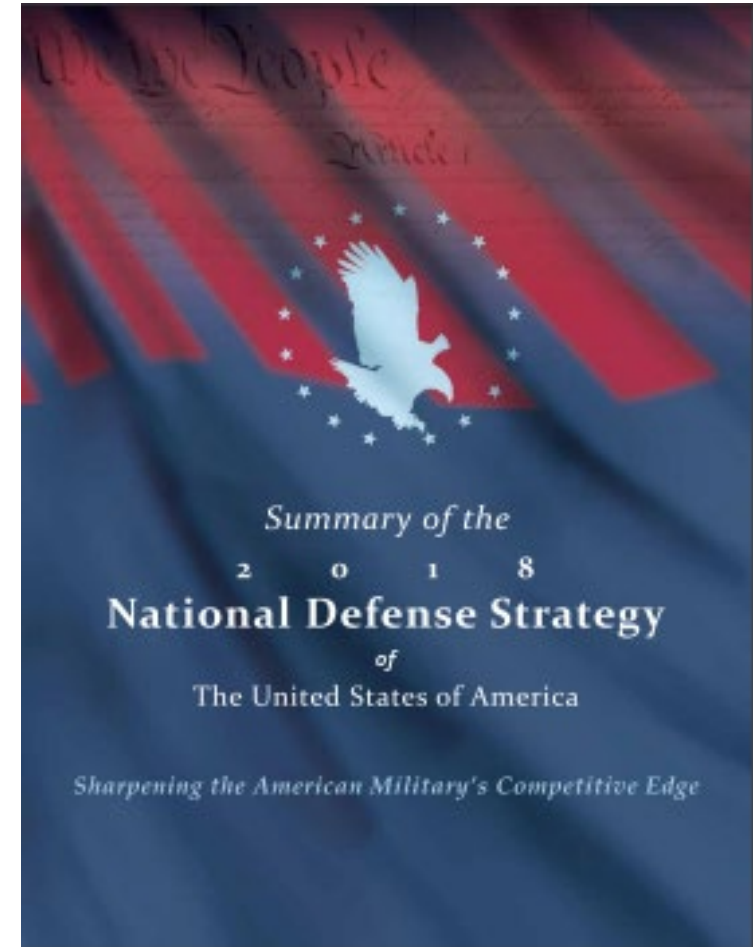
- ***The American way of war relies on technological superiority***
  - *Early Navy frigates*
  - *Ironclads*
  - *Stealth*
  - *Precision munitions*
  - *Space*
- ***We have missed technological advances***
  - *Pre WWI aviation*
  - *Radar*
  - *Gas turbines*
  - *Rockets*
- ***Defense technology is always advancing; today's advantage may be obsolete by tomorrow***



"The gas turbine could hardly be considered a feasible application to airplanes mainly because of the difficulty in complying with the stringent weight requirements imposed by aeronautics."  
- National Academy of Sciences (1940)

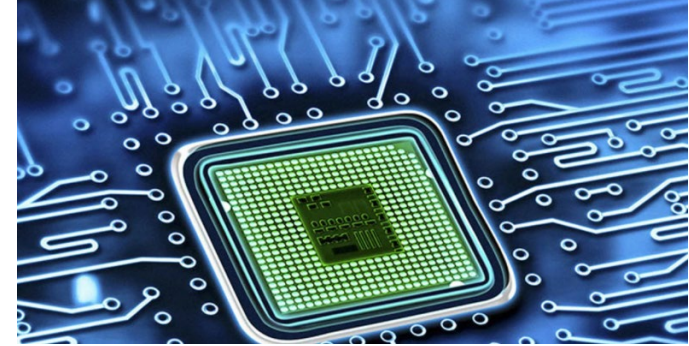
# Context: The National Defense Strategy 2018

- ***“Today, we are emerging from a period of strategic atrophy, aware that our competitive military advantage has been eroding...Inter-state strategic competition, not terrorism, is now the primary concern in U.S. national security.”***
- ***“China is a strategic competitor using predatory economics to intimidate its neighbors while militarizing features in the South China Sea. Russia has violated the borders of nearby nations and pursues veto power over the economic, diplomatic, and security decisions of its neighbors.”***
- ***“It is now undeniable that the homeland is no longer a sanctuary...terrorists...malicious cyber activity ... political and information subversion.”***
- ***“[We must] Modernize key capabilities. We cannot expect success fighting tomorrow’s conflicts with yesterday’s weapons or equipment.”***
- ***“We must anticipate the implications of new technologies on the battlefield, rigorously define the military problems anticipated in future conflict, and foster a culture of experimentation and calculated risk-taking.”***



# Modernization Priorities Drawn from the NDS

- ***Underlying capabilities***
  - *AI*
  - *Cyber*
  - *Autonomy*
  - *Microelectronics*
  - *FNC3*
- ***Delivered Effects***
  - *Space*
  - *Directed Energy*
  - *Hypersonics*
- ***Future Promise***
  - *Quantum*
  - *Biotechnology*



# Emerging Technology Priorities Key Issues

- **Hypersonics**
  - Airbreathing vs. boost-glide
  - Delivery at scale
  - Countering recent (bad) utility studies
- **Microelectronics**
  - Onshoring
  - Getting DOD on the commercial curve
  - DOD-unique needs (rad-hard)
  - Legacy buys and split fab
- **AI**
  - Poor understanding of what it is, what it can do
  - Buying its way into real systems
  - Establishing standards, shared platforms
  - Workforce

# Emerging Technology: Hypersonics

- **Utility and foreign threats fully acknowledge**
  - Significant increases in investments starting in 2020 after ~10 year pause
  - Leadership fully engaged
- **Recognition of international investments**
  - Peer competitors: China, Russia
  - Allies: Australia, UK
- **Some well-publicized demonstrations**
  - NASA X-43
  - AFRL X-51
  - Conventional Prompt Strike
- **Organizations**
  - Services: USAF, U.S. Army, U.S. Navy,\
  - OSD: DDR&E(M), JHTO, DARPA, TRMC, OUSD(A&S)
- **Challenges**
  - Until recently, efforts uncoordinated
  - Utility still be questioned, new vs. legacy systems
  - Bad investments still being made
  - Industrial base
  - Workforce



# Emerging Technology: Microelectronics

- **Fundamental to every part of national defense**
- **The U.S. is reliant on foreign sources for state-of-the-art microelectronics**
  - TSMC
  - Samsung
- **Current policy has the DOD well behind the commercial market (45nm vs 7 nm node size)**
  - Trusted foundries
  - Rad hard
- **Organizations**
  - Office of the Under Secretary of Defense (Research and Engineering)
  - Office of the Under Secretary of Defense (Acquisition and Sustainment)
  - Naval Surface Warfare Center Crane
- **Challenges**
  - The DoD is <1.5% of the total market, defense can't drive state-of-the-art alone
  - Leveraging commercial involves avoiding creation of ITAR restrictions, giving up on seamless custody.
  - Existing investment in legacy parts and components and end-of-life buys
  - Trusted vs. Zero Trust approaches



Credit: Shutterstock/Ivan Cholakov

## **DOD's Top Tech Priorities Shift to Microelectronics and 5G**

# Emerging Technology: Artificial Intelligence

- **Near-universal recognition of impact on future defense**
  - Keen interest in bringing commercial capabilities to the DOD
  - Much of the early investment from DOD but commercial incorporated it faster
- **Recognition of international investments**
  - Peer competitors: China, Russia
  - Allies: UK, Canada, Germany, India, France, Sweden, Norway
- **Some well-publicized demonstrations**
  - Project Maven
  - AlphaDogFight
- **Organizations**
  - The Joint Artificial Intelligence Center (JAIC)
  - Office of the Director of Defense Research & Engineering (Modernization)
  - DARPA
- **Challenges**
  - What's AI? What's ML? Is it the same as autonomy?
  - Real (perceived) ethical issues
  - Poor general understanding leads to bad investments
  - Too many programs invoking AI as a catch-all solution, no easy accounting
  - Workforce





# Introducing the Emerging Technologies Institute

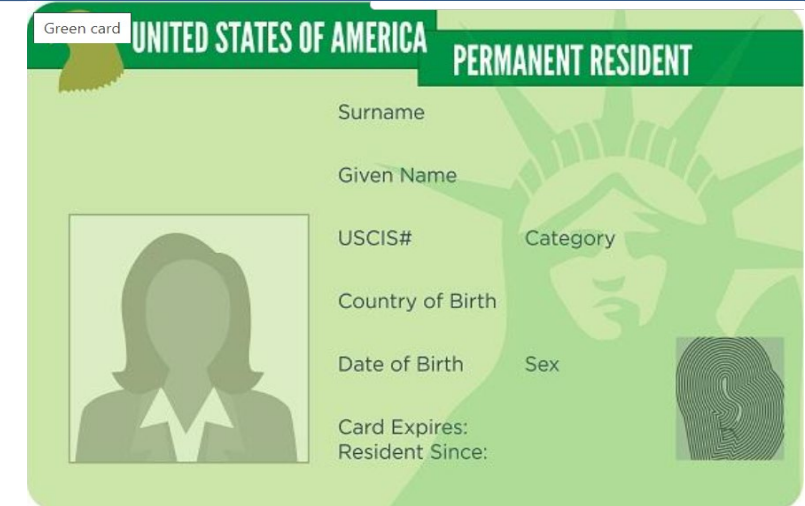
- **NDIA's ETI is a non-partisan institute focused on technologies that are critical to the future of national defense.**
  - **ETI has been established to provide research and analyses, as well as to convene open discussion and engage with national leaders, to inform the development and integration of emerging technologies into the defense industrial base.**
  - **ETI has been created as an entity within the NDIA governance structure. This allows ETI to conduct independent objective research while leveraging the experience and knowledge of NDIA's chapters, divisions, members, and partners.**
- **NDIA it is uniquely positioned to sponsor ETI. With an unparalleled ability to convene stakeholders and partners, ETI will build on NDIA's infrastructure, translating emerging technologies into concrete capabilities.**

# The Intersection of Policy and Technology

- **For government decision makers**
  - Need for objective information on critical defense technologies
  - Connections to the defense industrial base
- **For industry**
  - Need to be heard on key industrial base issues, to influence and set the national agenda
  - Credibility in tackling technology development and acquisition challenges
  - Connections to academic partners working at the cutting edge of critical technology development
- **For the Nation as a whole**
  - Address fundamental threats to the future of national security, focused on outmatching peer competitors and adversaries
  - Highlight the defense industrial base as it relates to innovation and technology investment for the country as a whole

# Roadblocks

- *Acquisition timelines*
- *The acquisition valley (actually, mountain) of death*
- *Legacy vs new*
- *Test and Evaluation*
- *Industrial Base vulnerabilities*
- *Workforce*
- *Many bad ideas*
- *Responding to adversaries without more harm than good*



# *Questions?*

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