Sustaining Affordable and Effective Hypersonic Capabilities

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Figure 1: The X-51 Waverider is a scramjet powered vehicle launched from an aircraft mother ship and brought to scramjet ignition speed and altitude by a mounted booster rocket. In a May 2013 test flight, it reached Mach 4.8 at about 20 km altitude over a period of 210 seconds.

Hypersonic Vehicles

Game Changers for Future Warfare?

By Dipl.-Ing. Hans-Ludwig Besser, DEU, Technical Director (ret.) Bayern-Chemie GmbH, subsidiary of MBDA Missile Systems

By Dr.-Ing. Dennis Göge, DEU, Executive Board Representative and Programme Coordinator Defence and Security Research, German Aerospace Center (DLR)

By Mr. Michael Huggins, USA, Chief Engineer Aerospace Directorate, Air Force Research Laboratory (AFRL)

By Mr. Alan Shaffer, USA, Director Collaborative Support Office (CSO) of NATO's Science & Technology Organisation (STO)

By Dr.-Ing. Dirk Zimper, DEU, Executive Officer Applied Vehicle Technology (AVT) Panel, Collaborative Support Office (CSO) of NATO's Science & Technology Organisation (STO)

ACQUISITION & SUSTAINMENT (A&S)

Mission

The Office of the Under Secretary of Defense for Acquisition and Sustainment provides policy and governance, for the Department of Defense and the national security innovation base, that enables the delivery and sustainment of critical capabilities to U.S. Service Members and allies.

Best Possible Operational Capability for the Taxpayer Dollar

NATIONAL DEFENSE STRATEGY (NDS)

- **Line of Effort (LOE) 1 - Increase Lethality**
- **LOE 2 - Strengthen Alliances and Attract New Partners**
- **LOE 3 - Reform the Department**

"As we continue to advance the Nation's security, let me reaffirm our path forward. The National Defense Strategy remains our guiding document and everything we do should support its stated objectives." – Mark Esper, Defense Secretary
June 24, 2019

Shift From Counterinsurgency to Competition of Great Powers

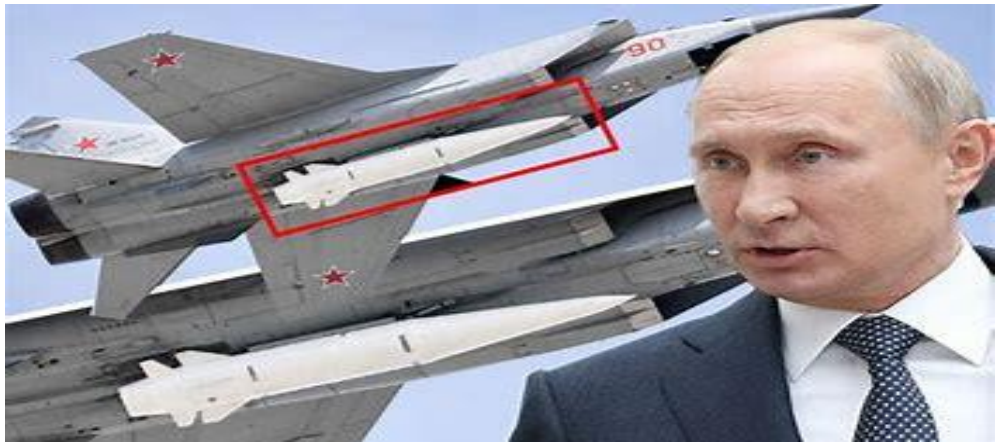
COMPETITION OF GREAT POWERS

- **Simultaneous Factors**
  - ➢ **Rise of Competitor Capabilities**
  - ➢ **Competition For Investment**
    - **Nuclear Deterrent Modernization**
    - **Missile Defense Review (MDR)**
    - **Counter ISIS**
    - **Counter UAS….. Etc.**

RISE OF COMPETITORS - HYPERSONICS

China is Leading the World in Hypersonic Technology due to Beijing Setting a Clear Investment Strategy to its Industrial Base, a Panel of National Security Experts Said Monday. "[The U.S.] Commercial Sector [and] Silicon Valley will Never Ever Develop" the Technologies Associated with Hypersonic Weapons, Roger Zakheim, a member of the National Defense Strategy Commission. – U.S. National Institute, 14 March 2019

RISE OF COMPETITORS - HYPERSONICS



Behind a clean, white, columned facade sits Moscow's Manezh Exhibition Hall, a stately gathering place for Russia's political, social, and religious elites, just a short stroll from Red Square. It was here, during his March 1, 2018 state of the nation address, President Vladimir Putin unveiled Russia's wonder weapons: hypersonic missiles and supermaneuverable gliders capable of dispatching intercontinental targets at speeds exceeding Mach 5 (five times the speed of sound) in two hours or less. With his reelection only a few weeks away, the president pinned Russia's very existence to staying one step ahead of the Americans. "Technological changes are happening at an increasing speed," "and those who take advantage of this new technology will launch forward. Those, said Putin, who are unable to do that will be buried under this tide of technological progress."
– National Interest, 8 June 2019

COMPETITION FOR INVESTMENT

CHINA

- **Investing Heavily in Hypersonic Cruise Missiles (HCMs) and Hypersonic Glide Vehicles (HGVs)**

- **Chinese Competition Three Dimensional**
  - **Illegal – Theft of Intellectual Property**
  - **Intense – Good Products For Less**
  - **Unfair – Demanding Firms Give Away Technology for China's Vast Market**

Source: The Economist, 23 September 2017

ACQUISITION & SUSTAINMENT

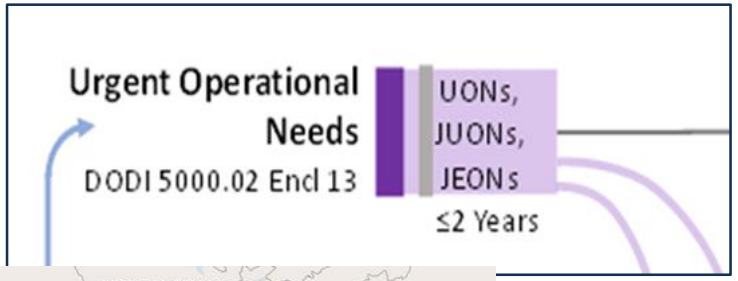
LOE 1 - INCREASE LETHALITY

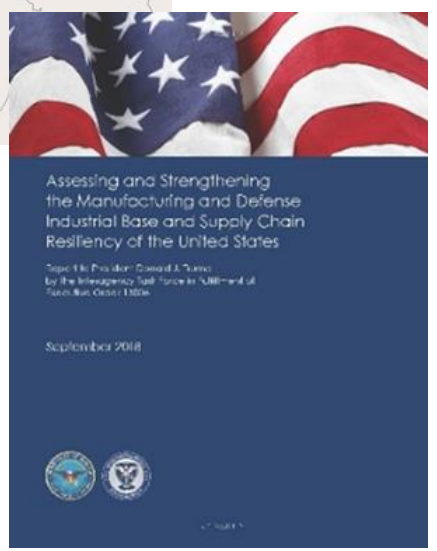
- **Improve F-35 Program Execution**

- **Modernize the Nuclear Deterrent**

LOE 1 - INCREASE LETHALITY

- **Provide Real-Time Response to COCOMS**
- **Strengthen Supply Chain Operations**
- **Implement Executive Order 13806 – Assessing and Strengthening the Manufacturing and Industrial Base**





LOE 2
STRENGTHEN ALLIANCES AND ATTRACT NEW PARTNERS

- UK Collaboration on Chem/Bio Elimination & Nuclear Modernization
- **Expand Collaboration with Emerging Partners**

LOE 3 - REFORM THE DEPARTMENT

- Execute FY 2016-2019 National Defense Authorization Act (NDAA) Acquisition Reforms
- Enhance DoD Acquisition Workforce Talent Management
- **Refine Internal A&S Business Processes**

IMPLEMENT EO 13806 - STRENGTHEN SUPPLY BASE

- What Materials Enable Hypersonics
  - Heat Resistant Materials
  - Ultra High and High Temperature Composites
  - Aeroshells
  - High Temperature Windows/Radomes
  - Others?
- Infrastructure
  - Test Facilities
- Tools
  - Defense Production Act Title III

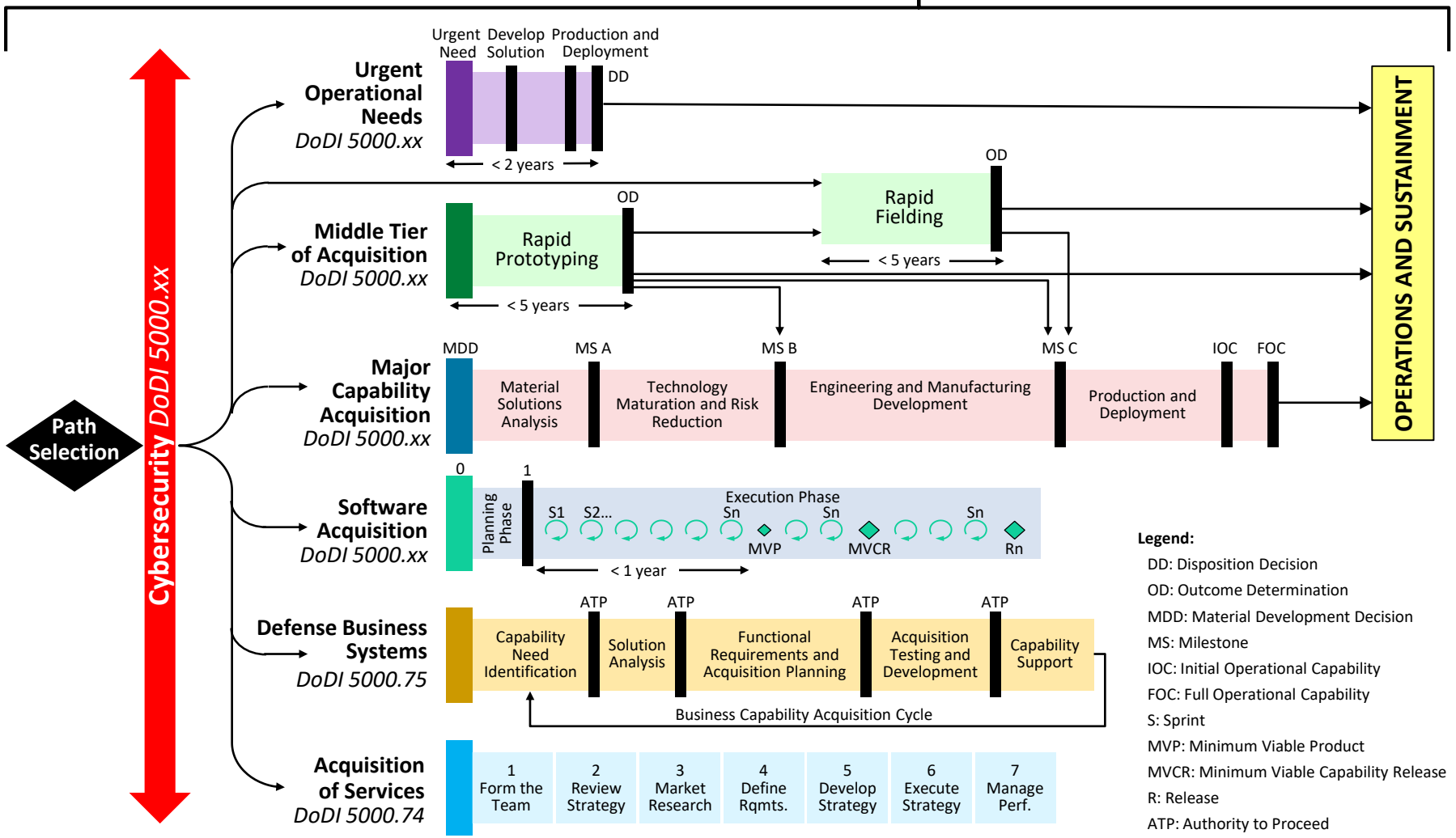
REFINE INTERNAL BUSINESS PROCESS

Adaptive Acquisition Framework - Enable Execution at the Speed of Relevance

Tenets of the Defense Acquisition System

1. Simplify Acquisition Policy
2. Tailor Acquisition Approaches
3. Empower Program Managers
4. Data Driven Analysis
5. Active Risk Management
6. Emphasize Sustainment

DoDD 5000.01: *The Defense Acquisition System*
DoDI 5000.02: *Operation of the Adaptive Acquisition Framework*



Legend:

- DD: Disposition Decision
- OD: Outcome Determination
- MDD: Material Development Decision
- MS: Milestone
- IOC: Initial Operational Capability
- FOC: Full Operational Capability
- S: Sprint
- MVP: Minimum Viable Product
- MVCR: Minimum Viable Capability Release
- R: Release
- ATP: Authority to Proceed

July 2019

HYPERSONICS SUSTAINMENT

- **While Being Developed As A Prototype, Several "Sustainment" Questions Need to be Addressed Early**
  - **Prototyping is Good, Prototyping While Addressing Production Factors is Better**
  - **Detailed Test Plan With Availability Data**
  - **Intellectual Property – Who Owns What**
  - **Supply Chain – What Materials are on Critical Path – What is the Supply Chain**
  - **Embedded Sensors / Condition Based Maintenance**
  - **Interfaces – It's Not Just the Missile**
  - **Modularity: Upgrade? Repair?**

HYPERSONICS

- Very Cool
- A Leap Forward
- Must Plan for
  - Production
  - Sustainment


Q
&
A

BACKUP

US Department of Defense Hypersonics Thrust Area Owners

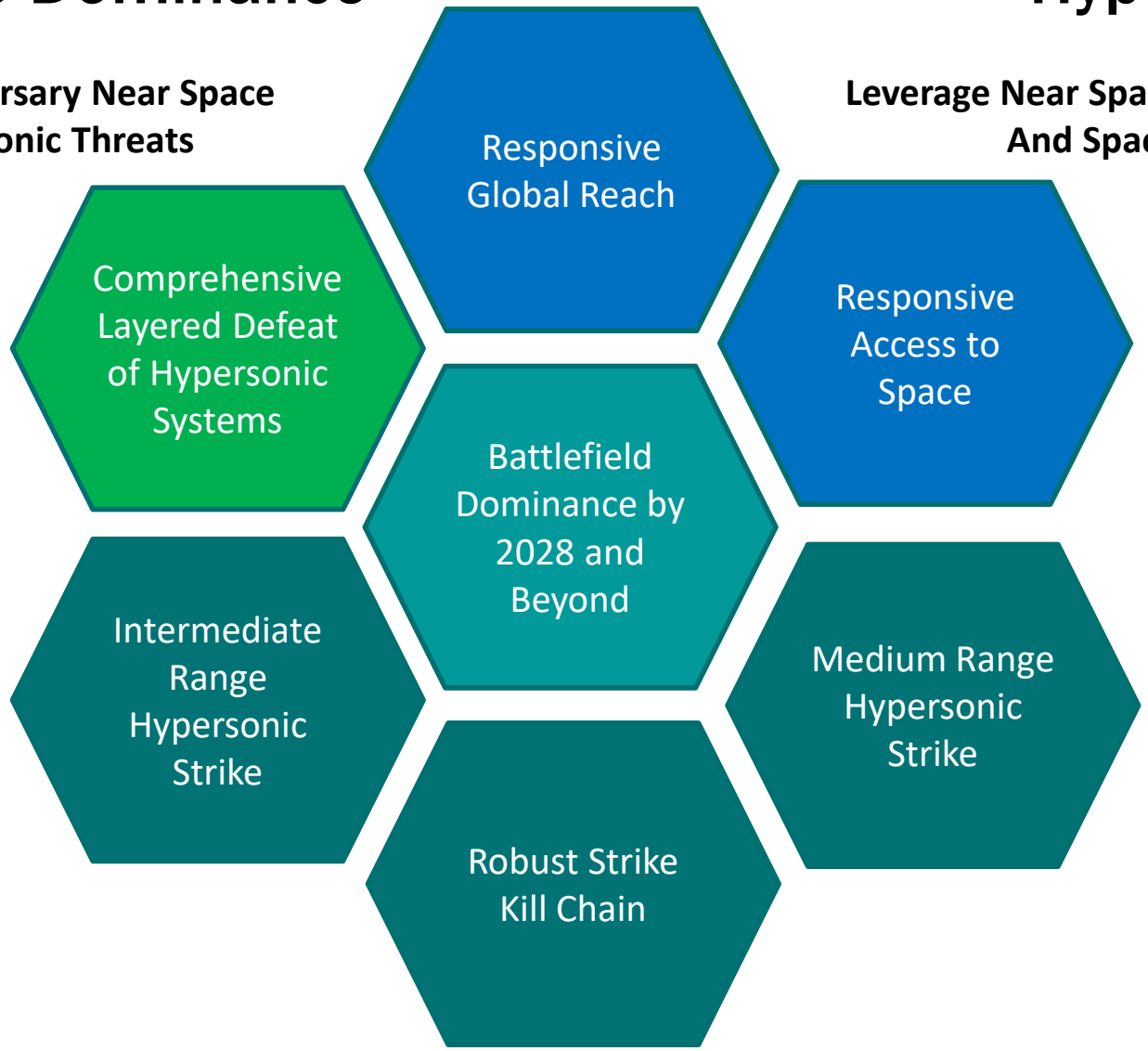
Office of the Under Secretary of Defense (Research and Engineering)

Road to Dominance

Hypersonics

Defeat Adversary Near Space Hypersonic Threats

Leverage Near Space For Global Reach And Space Control



Defeat Time Critical And Heavily Defended Land and Sea Targets From Survivable Standoff Range

OUSD R&E/AD, Hypersonics Leadership Team
Thrust Area Owners

Area	Name	Office	E-mail
OUSD R&E/ Assistant Director for Hypersonics	**White, Mike**	**OUSD R&E**	**michael.e.white168.civ@mail.mil**
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As of 24Jul2019