Homeland Defense & Security
Information Analysis Center

Technology and a New Arms Race

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Why the Concerns?

- "The central question is, therefore, not whether but how arms control can be implemented with regard to emerging technologies" – *NATO, Special Report: Emerging Technologies and Their Impact on Arms Control and Non-Proliferation, 2001*

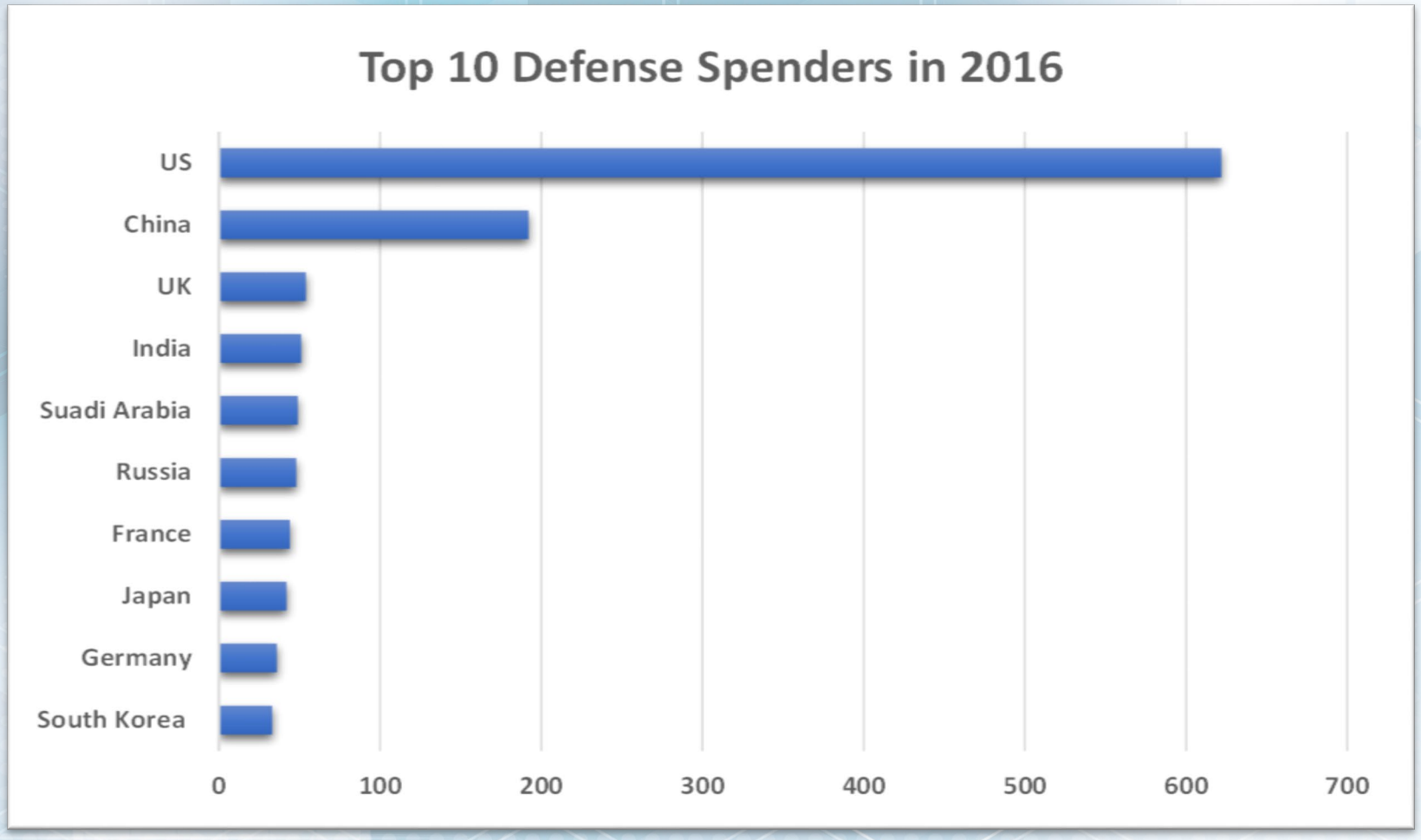
- "The fact that many beneficial applications could be misused for hostile purposes – with a focus on their suitability to enable the development of new or enhanced biological agents and weapons, primarily for criminal or terrorist purposes" – *UNICRI, Security Implications of Synthetic Biology and Nanobiotechnology: A Risks and Response Assessment of Advances in Biotechnology, 2012*

- "The potential impact on mission capabilities of surprises that pop up from emerging technologies or applications of existing technology is at present ambiguous" – *NAS Responding to Capability Surprise: A Strategy for US Naval Forces, 2013*

- "Emerging technologies are impacting the calculus of deterrence and conflict management by increasing uncertainty and compressing decision space" – *2015 National Military Strategy*


3-dimensional (3D) Printing
Artificial Intelligence (AI)
Weaponization Potential
Biotechnology / Synthetic Biology
Nanotechnology

Technology	Description	Applications
3D Printing	Process of using one layer of material at a time to create an object	Remote manufacturing
Artificial Intelligence	Display of distinctly human cognitive functions, such as learning and problem solving, by machines	Faster, more agile machines
Biotechnology	Exploitation of biological processes, organisms, and cellular components to create new technologies	Soldier performance modification
Nanotechnology	Science and engineering of matter at a scale of 1 to 100 nanometers	Enhanced weaponry
Synthetic Biology	Use of engineering principles to design biological systems and living organisms	Development of new bioweapons



http://rbth.com/defence/2016/12/14/russia-drops-out-of-worlds-top-5-defense-spenders-for-1st-time-in-30-years_657428 (Jane's Defence Budget)

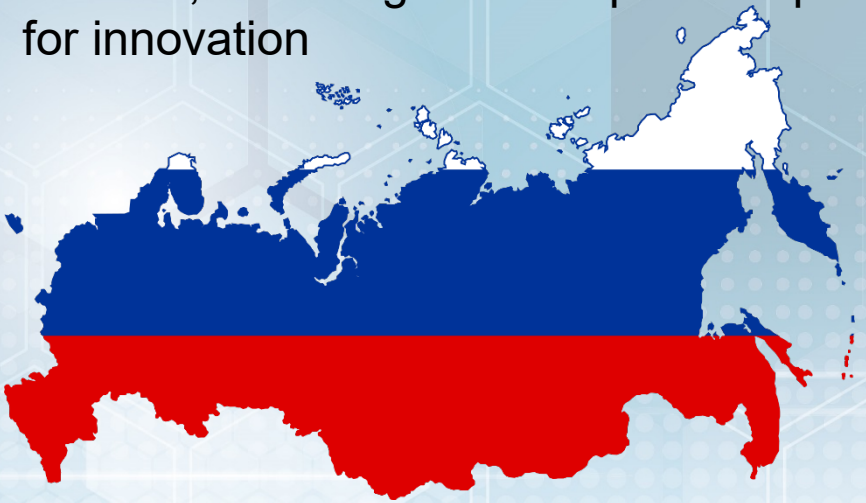
What are Some of the Challenges?

October 31, 2016 – *"The pacing competitors — not adversaries — are Russia and China, because they're developing advanced capabilities that potentially worry us."* – Deputy Defense Secretary Bob Work.

http://www.defense.gov/News/Article/Article/991434/deputy-secretary-third-offset-strategy-bolsters-americas-military-deterrence?source=GovDelivery

China

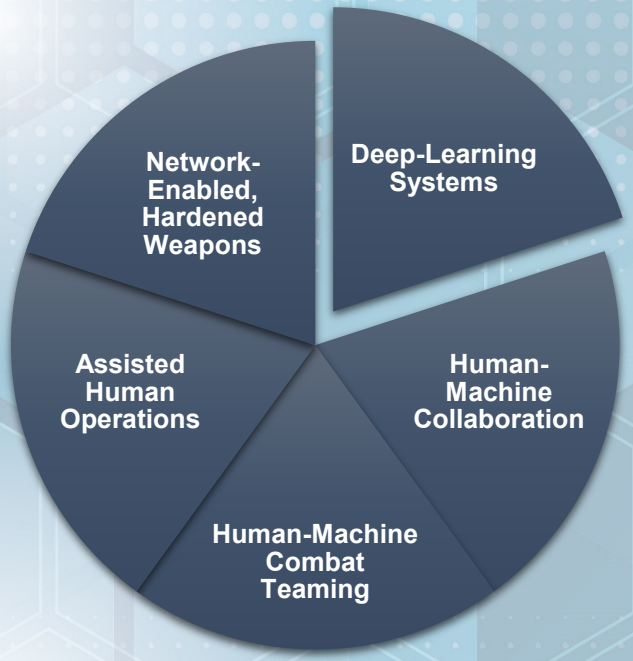
863 Program to stimulate the development of advanced technologies in a wide range of fields; 973 Program to improve capacity for innovation



Russian Federation

Russian Foundation for Advanced Research Projects — 50 ongoing contracts and projects

Artificial Intelligence

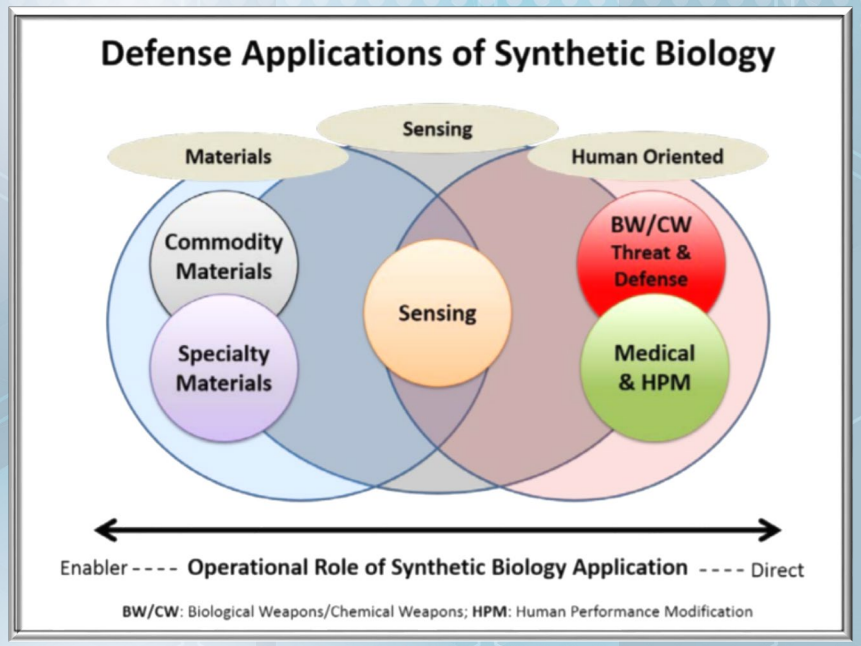


DoD Directive 3000.09 (November 2012) —
Expressly prohibits the creation or use of unmanned systems to "select and engage individual targets or specific target groups that have not been previously selected by an authorized human operator."

DoD FY 17 Budget —
$3.6 Billion for Third Offset Strategy

http://www.defensenews.com/articles/us-air-force-key-to-third-ohttp://; www.dodlive.mil/index.php/2016/03/3rd-offset-strategy-101-what-it-is-what-the-tech-focuses-are/ffset-strategy; http://www.bbc.com/future/story/20150715-killer-robots-the-soldiers-that-never-sleep

Synthetic Biology



2008 – Key Laboratory of Synthetic Biology (KLSynB)

DARPA – $100 million (2014)

Defence Science and Technology Laboratory (Dstl) – nearly $5 million

Strategic Targets for Synthetic Biology in China

5 years:
- Database of standardized parts and computational competency for designing parts and devices
- Module design and production of chemicals and biomaterials
- Validated design of devices to increase plant tolerance of drought and salinity

10 years:
- Expanded database of standardized parts and devices and computational competency for design of bio-systems
- Commercial production of selected chemicals and biomaterials
- Validated design of synthetic devices for nitrogen fixation

20 years:
- Integrated platforms for design, modeling, and validation of bio-systems
- Commercial production of a range of natural compounds, drugs, chemicals, and biofuels
- Clinical application of devices and bio-systems for detecting, controlling, or treating major diseases
- Creation of artificial microbial life

Office of Assistant Secretary of Defense for Research and Engineering, Technical Assessment: Synthetic Biology, 2015; http://synbiobeta.com/news/rapid-growth-synthetic-biology-china/ (National Academy of Sciences, Strategies for Advancing Synthetic Biology), 2013; http://www.army-technology.com/features/featuresynthetic-biology-dstls-search-for-novel-materials-4892830/

Nanotechnology

1995 - Former Vice Chairman of the Joint Chiefs of Staff, Admiral David Jeremiah stated that military applications of molecular manufacturing have greater potential to change the balance of power than even nuclear weapons

1996 - Major General Sun Bailin of the Chinese Academy of Military Science wrote an article titled "Nanotechnology weapons on future battlefields"

2016 - Iran has been placed 6th in the latest rankings of production of nanoscience, placing the country just after China, US, India, South Korea, and Germany.

http://en.mehrnews.com/news/122251/Iran-ranks-6th-in-nanoscience-production; http://www.zyvex.com/nanotech/nano4/jeremiahPaper.html; Bailin Major General Sun (1996), "Nanotechnology weapons on future battlefields" in National Defence, June 15, 1996

3D Printing

Country	Defense Applications
United States	Missile components
China	Ship replacement parts Vehicle parts
Russia	Bullets
United Kingdom	Drones
Israel	Drones Aircraft parts

https://3dprint.com/128936/3d-printing-us-military/; http://www.3ders.org/articles/20161113-russian-research-group-successfully-tests-3d-printed-bullets.html; https://3dprint.com/88641/china-army-pla-3d-print/; http://www.3ders.org/articles/20161113-russian-research-group-successfully-tests-3d-printed-bullets.html; http://bgr.com/2016/07/08/chemical-drones-uk-scientiests/; https://3dprint.com/86114/israelis-3d-printers-robots/; https://3dprint.com/130515/iaf-3d-printed-parts/; https://3dprint.com/35981/china-pla-navy-3d-printing/

Technical Inquiry Service

HDIAC provides up to 4 free hours of information services:

- Literature searches
- Product/document requests
- Analysis within our eight focus areas – *Alternative Energy, Biometrics, CBRN Defense, Critical Infrastructure Protection, Cultural Studies, Homeland Defense and Security, Medical, Weapons of Mass Destruction*

Core Analysis Task (CAT)

Challenging technical problems requiring more than 4 hours of research, can be solved by initiating a CAT:

- Pre-competed, pre-awarded, contract vehicles
- Work can begin on a project approximately two months after the statement of work has been approved
- Cap of $500,000
- Must be completed in less than 12 months

For more information: https://www.hdiac.org/technical_services

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