

Políticas públicas de CT&I e Defesa Nacional

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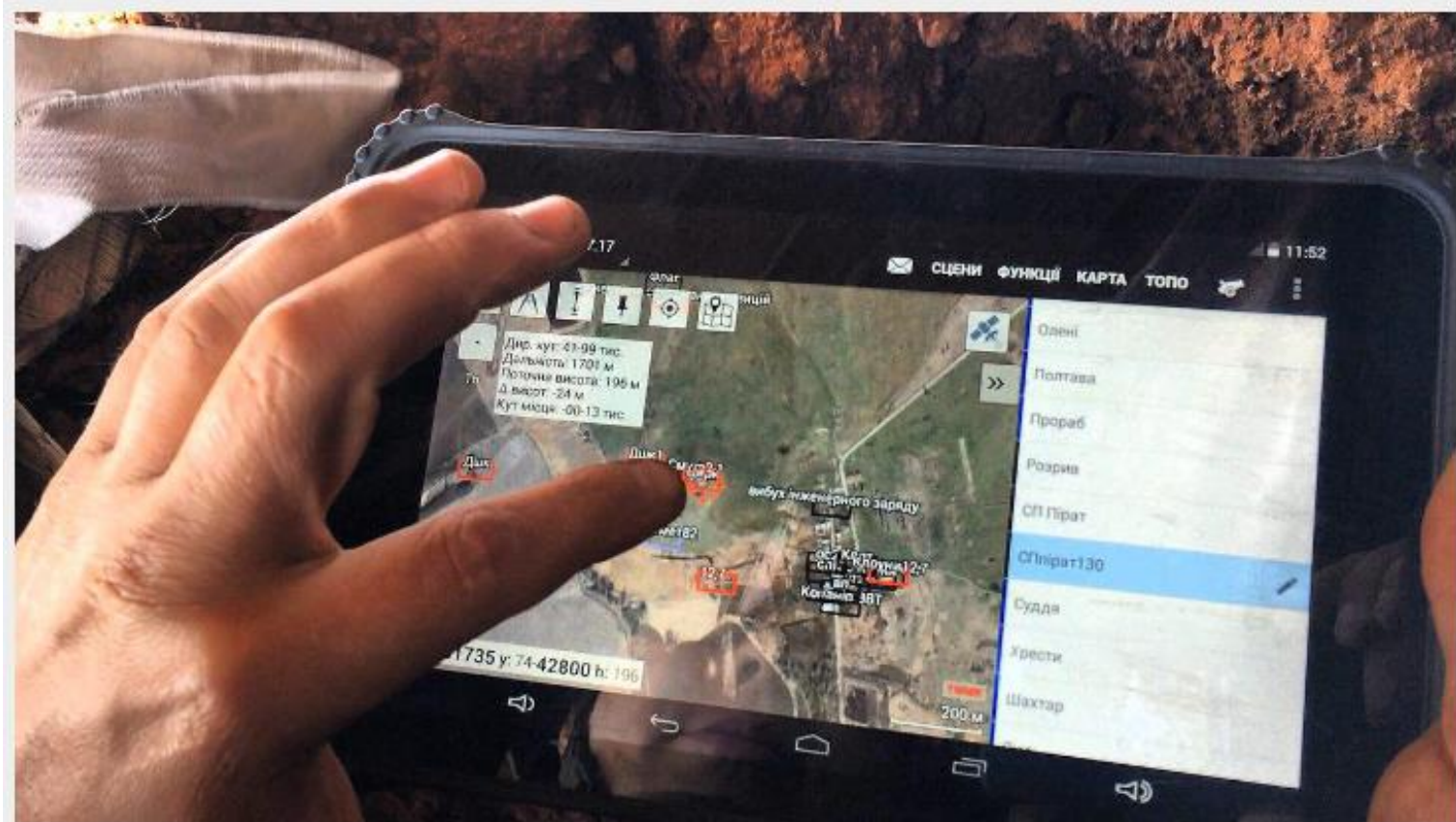
Bacharel em Relações Internacionais (USP)

CV Lattes: <http://lattes.cnpq.br/0852366132689311>

ROTEIRO

1. A relação entre CT&I e Poder Militar
2. O desafio de estabelecer prioridades
3. O peso das inovações civis/comerciais
4. A importância do “poder de compra do Estado”/ “Cliente”

“Army SOS took a very creative approach. Instead of looking for paper maps, they started working with software developers in Kyiv who helped to install satellite maps on **common electronic devices – tablets and smartphones**”



Kropiva (Nettle) user interface. Image credit: Army SOS

Ukraine makes it obvious DoD has to change how it buys weapons

By Mislav Tolusic

Thursday, Oct 13



U.S. Marines prepare to deploy cargo rigged with a parachute from the back of a C-130 aircraft during an air delivery exercise over Japan. (Sgt. Hailey D. Clay/U.S. Marine Corps)

*“Ukraine is a true **“dual-use” technologies war**; commercial products are widely used by both sides. Consumer drones are detecting and tracking unit movements, internet satellite maps are used for planning operational maneuvers and commercial satellites are providing internet/communication services”*

PONTO 1 DE 4

CT&I e Poder Militar
podem caminhar juntos
(mas não é automático)

IV REVOLUÇÃO INDUSTRIAL

Exemplo:



- INTERNET DAS COISAS (IOT)
- INTELIGÊNCIA ARTIFICIAL
- ROBÓTICA
- NOVOS MATERIAIS
- MANUFATURA ADITIVA (“IMPRESSÃO 3D”)
- DRONES
- BIOTECNOLOGIAS
- NEUROTECNOLOGIAS
- REALIDADE VIRTUAL E AUMENTADA
- GEOENGENHARIA (*MUDANÇA CLIMÁTICA)
- TECNOLOGIAS ESPACIAIS
- ETC.

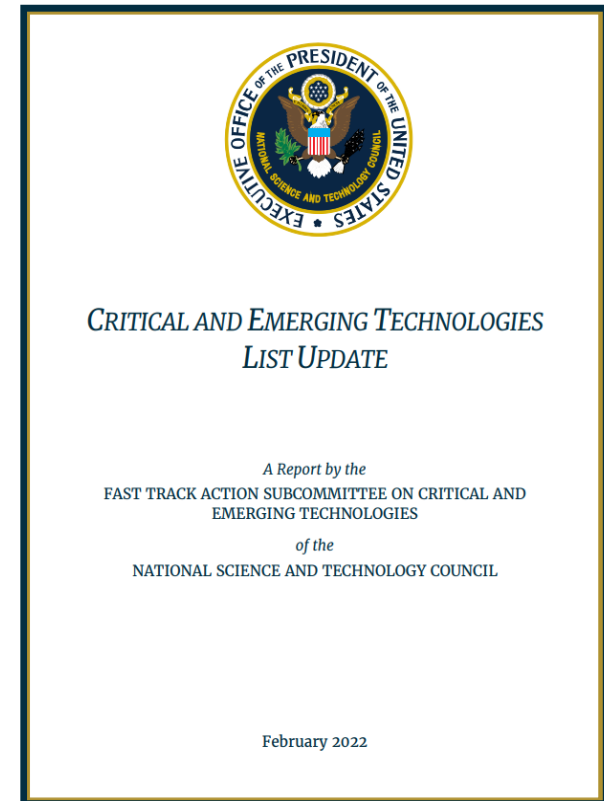
TECNOLOGIAS CRÍTICAS E EMERGENTES

Critical and Emerging Technologies List

The following critical and emerging technology areas are of particular importance to the national security of the United States:

- Advanced Computing
- Advanced Engineering Materials
- Advanced Gas Turbine Engine Technologies
- Advanced Manufacturing
- Advanced and Networked Sensing and Signature Management
- Advanced Nuclear Energy Technologies
- Artificial Intelligence
- Autonomous Systems and Robotics
- Biotechnologies
- Communication and Networking Technologies
- Directed Energy
- Financial Technologies
- Human-Machine Interfaces
- Hypersonics
- Networked Sensors and Sensing
- Quantum Information Technologies
- Renewable Energy Generation and Storage
- Semiconductors and Microelectronics
- Space Technologies and Systems

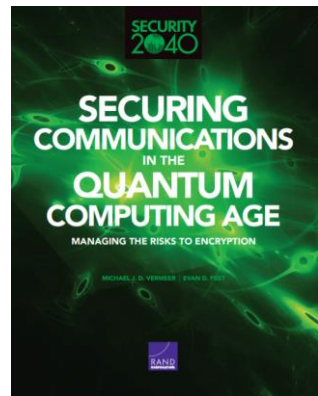
Exemplo:





<https://www.intel.com/pressroom/newsroom/articles/2417636/6/black-hornet-nano-uav>

NANO UAVs/DRONES SWARMS



QUANTUM COMPUTING



Boeing - <http://www.boeing.com/defense-air-power-teaming-systems/index.page#gallery>

UNMANNED TEAMING



https://en.wikipedia.org/wiki/DARPA_Falcon_Project#/media/File:Speed_is_Life_HT_V-2_Reentry_New.jpg

HYPERSONIC MISSILES



<http://www.oddsmatch.com/en-us/news/features/2019/features/how-laser-weapon-sets-are-changing-the-defense-equation.html>

LASERS



<https://www.defenceconnect.com.au/key-enablers/680-darpa-research-development-creates-real-time-multi-domain-kill-nets>

MULTI-DOMAIN



USAF <https://www.thedrive.com/the-war-zone/36229/the-air-force-just-tested-robot-dogs-for-use-in-base-security>

ROBOTICS

09 APRIL 2019

India's DRDO reveals additional details of recent ASAT missile test

by Rahul Bedi
JANES.com - <https://www.janes.com/defence-news/news-detail/indias-drdo-reveals-additional-details-of-recent-asat-missile-test>



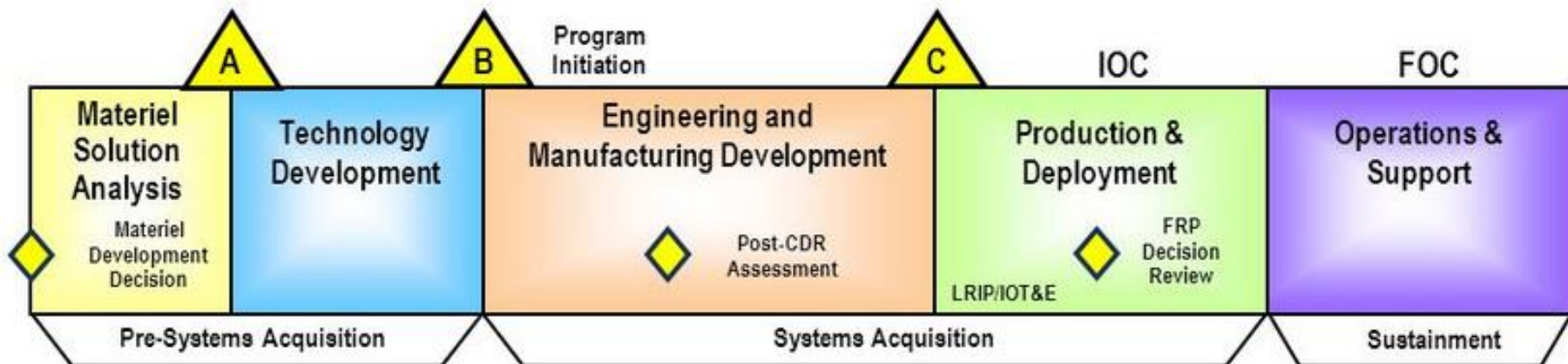
SPACE MILITARIZATION etc.

PONTO 2 DE 4

Recursos (**orçamento**, tempo, pessoal etc.)
são limitados

Defense Acquisition System Weighted Expenditures

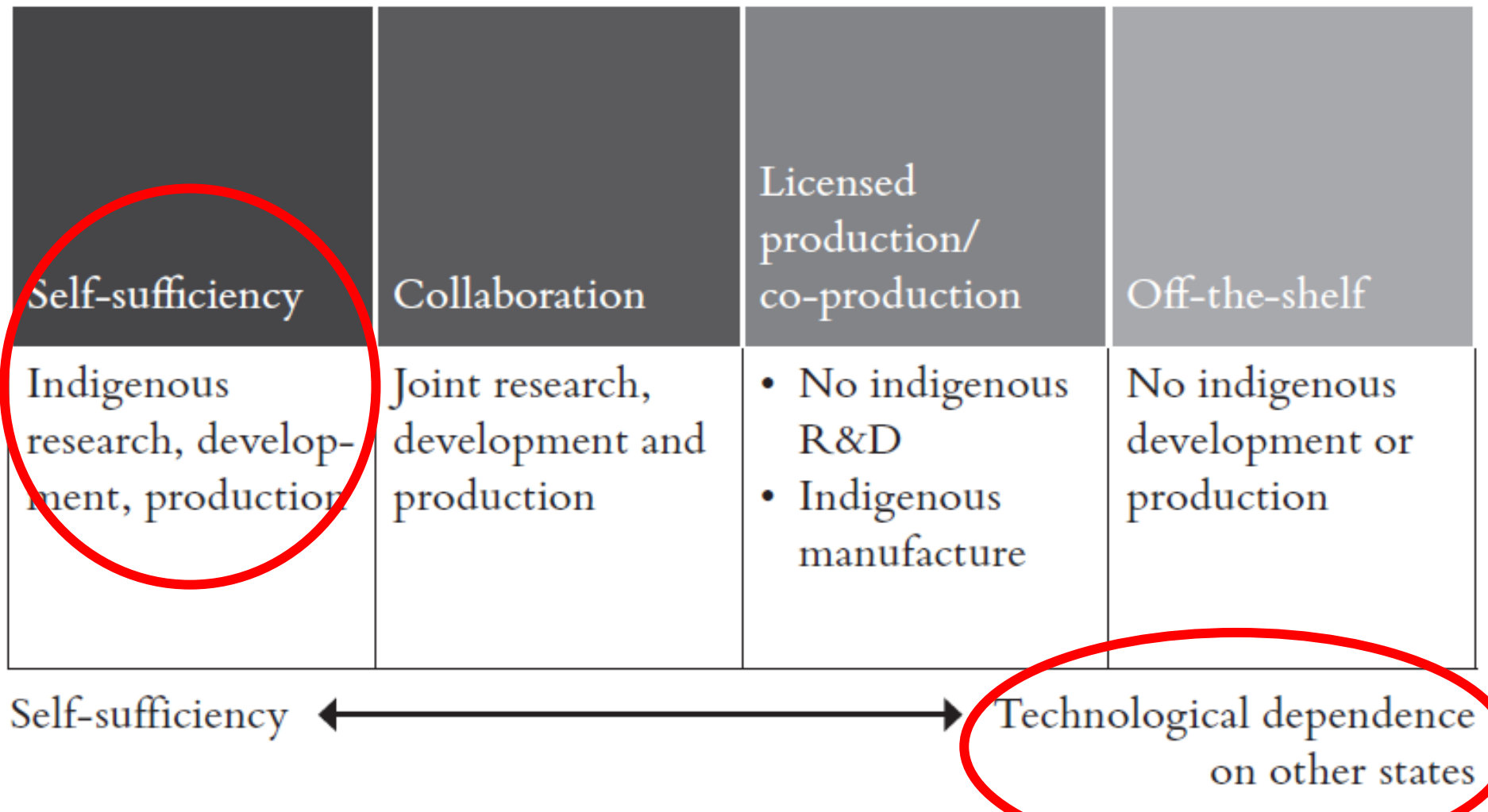
DoDI 5000.02 Perspective



Warfighter and Sustainment Organization Perspective



Figure 2: Alternative British weapons acquisition strategies



Source: Andrew Dorman, Matthew Uttley and Benedict Wilkinson, *A benefit, not a burden*, The Policy Institute at King's Paper (London: King's College London, 2015), p. 25.

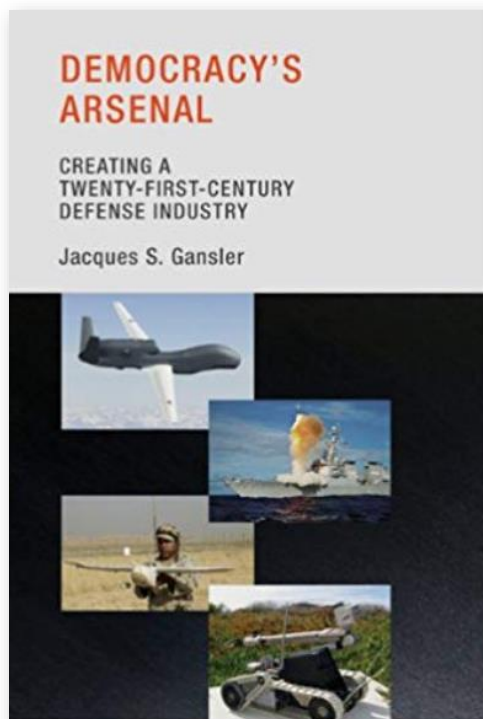
MATTHEW R. H. UTTLEY AND BENEDICT WILKINSON. A spin of the wheel? Defence procurement and defence industries in the Brexit debates. *International Affairs* 92: 3 (2016) 569–586, p. 577.



- **GERAÇÃO DE EMPREGOS DIRETOS E INDIRETOS**
 - **GERAÇÃO DE CT&I**
 - **POTENCIAL DE EXPORTAÇÕES**
 - **TRANSBORDAMENTOS TECNOLÓGICOS**
 - **IMPOSTOS**
 - **MARGENS DE AUTONOMIA ESTRATÉGICA**
- Etc.

- **ATENDIMENTO DOS REQUISITOS?**
- **CUSTOS DO DESENVOLVIMENTO**
- **TEMPO DE DESENVOLVIMENTO**
- **RISCOS DO DESENVOLVIMENTO**
- **ATRASOS**
- **DESAFIO DA MANUTENÇÃO DAS CAPACITAÇÕES TECNOLÓGICAS, INDUSTRIAIS E TÉCNICAS AO LONGO DO TEMPO;**

Etc.



IMPORTÂNCIA DA TECNOLOGIA

Investimentos em P&D em defesa **historicamente** proporcionaram desdobramentos industriais mais amplos: motores aeronáuticos, comunicação por satélites, **internet, GPS**, computação etc.

Jacques S. Gansler



Former Professor and Roger C. Lipitz Chair in Public Policy and Private Enterprise
University of Maryland School of Public Affairs Center for Public Policy and Private Enterprise
2101 Van Munching Hall
College Park, MD 20742
United States

The Honorable Jacques S. Gansler, former Under Secretary of Defense for Acquisition, Technology, and Logistics, was a professor and held the Roger C. Lipitz Chair in Public Policy and Private Enterprise in the School of Public Policy, University of Maryland; he was also the Director of the Center for Public Policy and Private Enterprise. As the third-ranking civilian at the Pentagon from 1997–2001, Dr. Gansler was responsible for all research and development, acquisition reform, logistics, advanced technology, environmental security, defense industry, and numerous other security programs. Before joining the Clinton

administration, Dr. Gansler held a variety of positions in government and the private sector, including Deputy Assistant Secretary of Defense (Material Acquisition), Assistant Director of Defense Research and Engineering (Electronics), Senior Vice President at TASC, Vice President of ITT, and engineering and management positions with Singer and Raytheon Corporations. Throughout his career, Dr. Gansler had written, published, testified, and taught on subjects related to his work. He was the author of five books and over 100 articles. His most recent book was Democracy's Arsenal: Creating a 21st Century Defense Industry (MIT Press, 2011).

DEMOCRACY'S ARSENAL

CREATING A
TWENTY-FIRST-CENTURY
DEFENSE INDUSTRY

Jacques S. Gansler



“Nonetheless, the purpose of defense expenditure is not economic stimulation, economic growth, or employment (or politics) but must be justified on the basis of the nation’s national security needs” (GANSLER, 2011, p. 21)

Como funciona o Domo de Ferro, sistema antimísseis de Israel

Aclamado como "seguro de vida" do país, sistema teria interceptado ao menos 2.400 projéteis nos últimos dez anos. Devido a custo alto, só é empregado para proteger áreas habitadas.



Table 1. The 40 countries with the highest military expenditure in 2021

Spending figures and GDP are in US dollars, at current prices and exchange rates. Changes are in real terms, based on constant (2020) US dollars. Percentages below 10 are rounded to 1 decimal place; those over 10 are rounded to whole numbers. Figures and percentage shares may not add up to stated totals or subtotals due to the conventions of rounding.

Rank		Country	Spending (\$ b.), 2021	Change (%)		Spending as a share of GDP (%) ^b		World share (%), 2021
2021	2020 ^a			2020-21	2012-21	2021	2012	
1	1	United States	801	-1.4	-6.1	3.5	4.5	38
2	2	China	[293]	4.7	72	[1.7]	[1.7]	[14]
3	3	India	76.6	0.9	33	2.7	2.6	3.6
4	6	United Kingdom	68.4	3.0	3.7	2.2	2.4	3.2
5	5	Russia	65.9	2.9	11	4.1	3.7	3.1
Subtotal top 5			1 305	..	..	..	..	62
6	8	France	56.6	1.5	13	1.9	1.9	2.7
7	7	Germany	56.0	-1.4	24	1.3	1.2	2.7
8	4	Saudi Arabia	[55.6]	-17	-15	[6.6]	[7.7]	[2.6]
9	9	Japan	54.1	7.3	18	1.1	1.0	2.6
10	10	South Korea	50.2	4.7	43	2.8	2.5	2.4
Subtotal top 10			1 578	..	..	..	..	75
11	11	Italy	32.0	4.6	9.8	1.5	1.4	1.5
12	12	Australia	31.8	4.0	42	2.0	1.7	1.5
13	13	Canada	26.4	3.1	40	1.3	1.1	1.3
14	18	Iran	24.6	11	-17	2.3	2.8	1.2
15	14	Israel	24.3	3.1	35	5.2	5.6	1.2
Subtotal top 15			1 717	..	..	..	..	81
16	17	Spain	19.5	5.6	5.2	1.4	1.4	0.9
17	15	Brazil	19.2	-4.3	-5.3	1.2	1.4	0.9
18	16	Turkey	15.5	-4.4	63	2.1	2.0	0.7
19	20	Netherlands	13.8	-0.5	26	1.4	1.2	0.7
20	19	Poland	13.7	-5.2	58	2.1	1.8	0.6
21	21	Taiwan	13.0	1.4	7.9	1.7	2.1	0.6
22	..	Qatar	11.6	..	..	4.8	..	0.5
23	22	Pakistan	11.3	-0.7	47	3.8	3.5	0.5
24	23	Singapore	11.1	7.1	24	3.0	3.1	0.5
25	25	Colombia	10.2	4.7	30	3.4	3.2	0.5



America's industrial base is at risk, and the military may feel the consequences

By: Aaron Mehta | May 22, 2018

498

 108



America's Military Doesn't Have Enough Money to Do Its Job

Donald Trump promised a bigger defense budget, but the Pentagon is still waiting.

BY MAX BOOT | NOVEMBER 22, 2017, 9:00 AM

US Military Faces a Crisis and Needs More Money, Report to Congress Warns



Produc < https conseq

By Yuval Rosenberg | November 14, 2018

< https://www.thefiscaltimes.com/2018/11/14/US-Military-Faces-Crisis-and-Needs-More-Money-Report-Congress-Warns >

A U.S. soldier takes cover near a patrol base south of Baghdad, Iraq, on Aug. 29, 2007. (David Furst/AFP/Getty Images)

< https://foreignpolicy.com/2017/11/22/americas-military-doesnt-have-enough-money-to-do-its-job/ >

DUAS METAS DA OTAN:

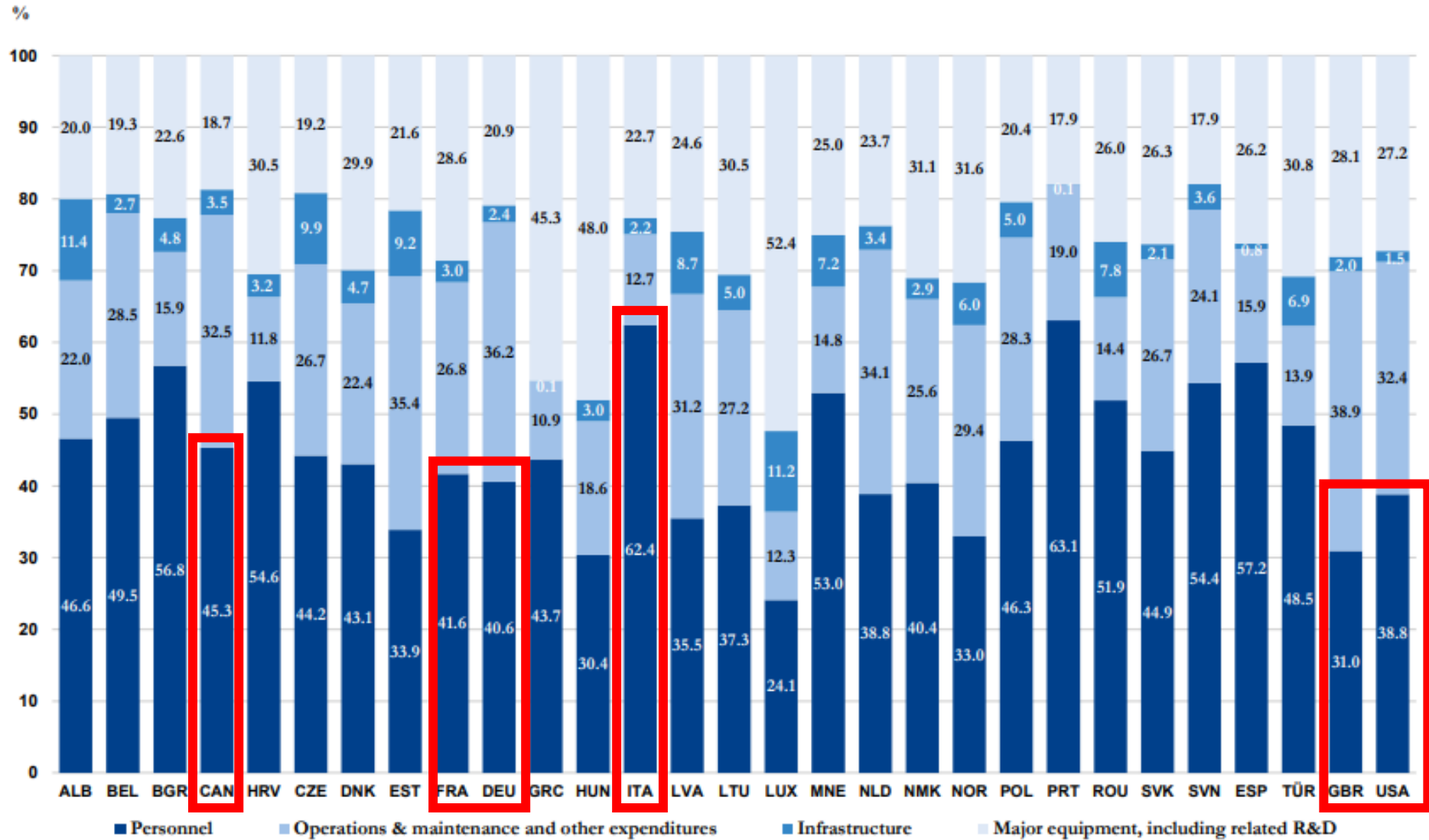
META 1: 2% PIB

META 2: 20% para Equipamento

Graph 7 : Main categories of defence expenditure (%)

(percentage of total defence expenditure)

2022e



ATENÇÃO: não é a mesma metodologia da OTAN (serve apenas como aproximação)

Table 2 Breakdown of China's Defense Expenditure (2010-2017)

(in RMB billion yuan)

Year	Personnel Expense		Training and Sustainment Expense		Equipment Expense		Total
	Amount	Percentage (%)	Amount	Percentage (%)	Amount	Percentage (%)	
2010	185.931	34.9	170.047	31.9	177.359	33.2	533.337
2011	206.506	34.3	189.943	31.5	206.342	34.2	602.791
2012	195.572	29.2	232.994	34.8	240.626	36.0	669.192
2013	200.231	27.0	269.971	36.4	270.860	36.6	741.062
2014	237.234	28.6	267.982	32.3	323.738	39.1	828.954
2015	281.863	31.0	261.538	28.8	365.383	40.2	908.784
2016	306.001	31.3	266.994	27.4	403.589	41.3	976.584
2017	321.052	30.8	293.350	28.1	428.835	41.1	1043.237

Sources: Data on China's defense expenditure submitted to the UN by the Chinese government

PONTO 3 DE 4

AS GRANDES INOVAÇÕES
ATUALMENTE VEM DO SETOR CIVIL

Capitalise on changes in procurement

A key edge that many commercial firms have is an agile culture, allowing them to get new ideas to market faster. That is a marked contrast with the culture at many incumbent defence firms, refined over years to traditional waterfall processes and extremely long lead times. A recent publication by PwC's Global Defence Advisory Board, about the challenges that governments face in building a future-ready defence force, addressed the need for faster procurement. "When a platform is scoped 30 years before its delivery, changing course mid-development is a unique problem.... [A] reduction in procurement times would facilitate the ability to respond more quickly and efficiently to the changing demands in fighting war over time."

Incumbent firms can forge partnerships with commercial companies and other entities — including academia — to ensure they have access to the latest cutting-edge technologies (and are aware of newer technologies coming over the horizon). For many years, defence technology spawned commercial applications; today, the flow of disruptive new ideas moves in the opposite direction.

Companies need to ensure they actively scan the commercial landscape for technological innovation. Boeing's HorizonX initiative, which invests in early-stage companies with promising technologies, is a good example.

For many years, defence technology spawned commercial applications; today, the flow of disruptive new ideas moves in the opposite direction.

More broadly, companies can revamp their processes to develop new platforms and systems with an emphasis on speed and agility, in order to fend off new competition. In the US, the Next Generation Air Dominance programme, for example, aims to field a new fighter by 2025, much faster than previous-generation planes. To achieve that, the programme involves an open-source discussion among multiple competitors to develop new technologies and get them into use faster.¹⁰

Notably, the Next Gen programme will also consist of smaller, shorter-cycle purchases, with modular systems and avionics packages that can be rapidly swapped or replaced to outfit planes for specific missions, or to more easily upgrade their capabilities over time. In France, an initiative known as digital design, manufacturing and services (DDMS) is using a similar approach to speed product development at Airbus and Dassault.

As the PwC Global Defence Advisory Board put it, "In designing future forces, planners and decision makers should seriously consider abandoning their overreliance on major platforms. This means scrutinising any plan justified by a new-for-old replacement policy... Instead of replacing equipment with a new model, planners should assess the use case for the technology first." (Notably, some question whether the investment among Western countries in a next-generation fighter is warranted, given that other countries are investing heavily in hypersonic missiles capable of achieving the same outcomes as a fighter and at lower cost.)



Apple, Microsoft, Amazon, Google And Facebook Make Up A Record Chunk Of The S&P 500. Here's Why That Might Be Dangerous



Sergei Klebnikov Forbes Staff

Markets

I cover breaking news, with a focus on money and markets.

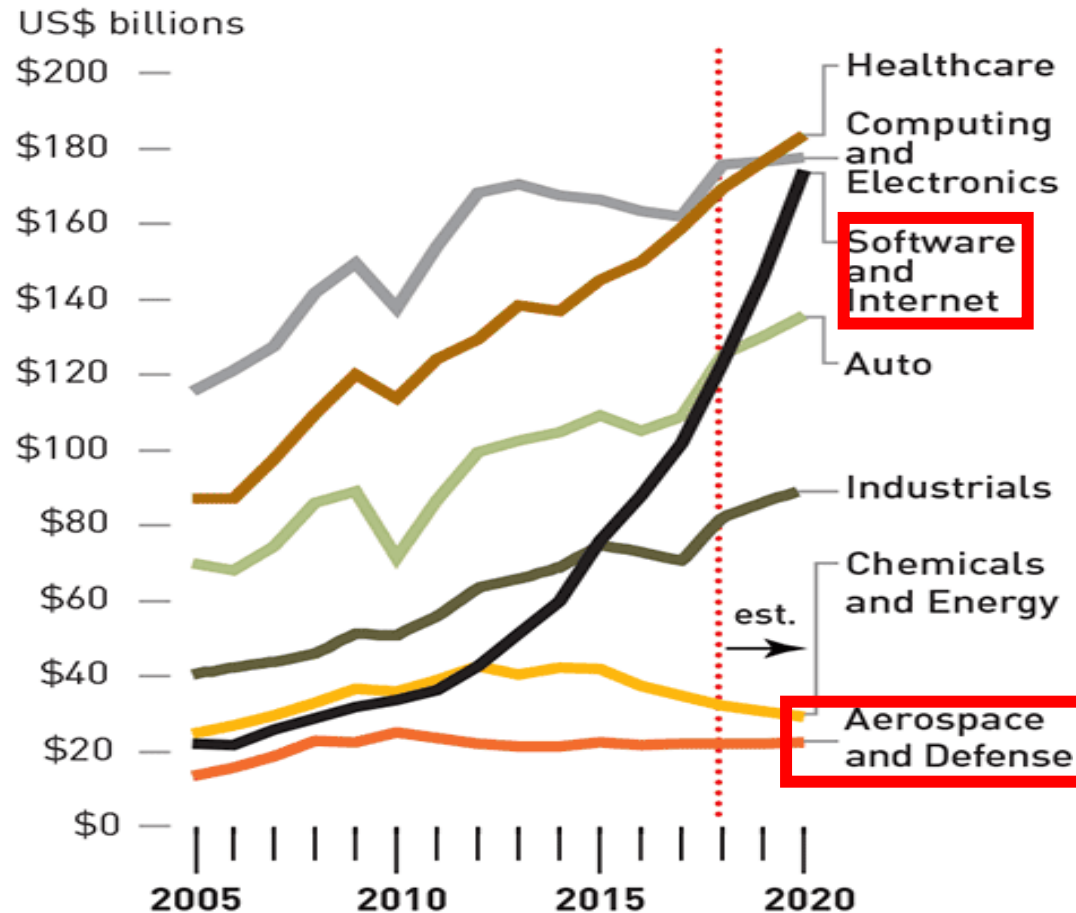


The market's top five biggest companies: Apple, Amazon, Microsoft, Facebook and Google. DESIGN BY FORBES

Today, these five companies together make up about 22% of the S&P 500 index today—the highest level on record, which has raised concerns on Wall Street about too much market concentration in a handful of stocks.

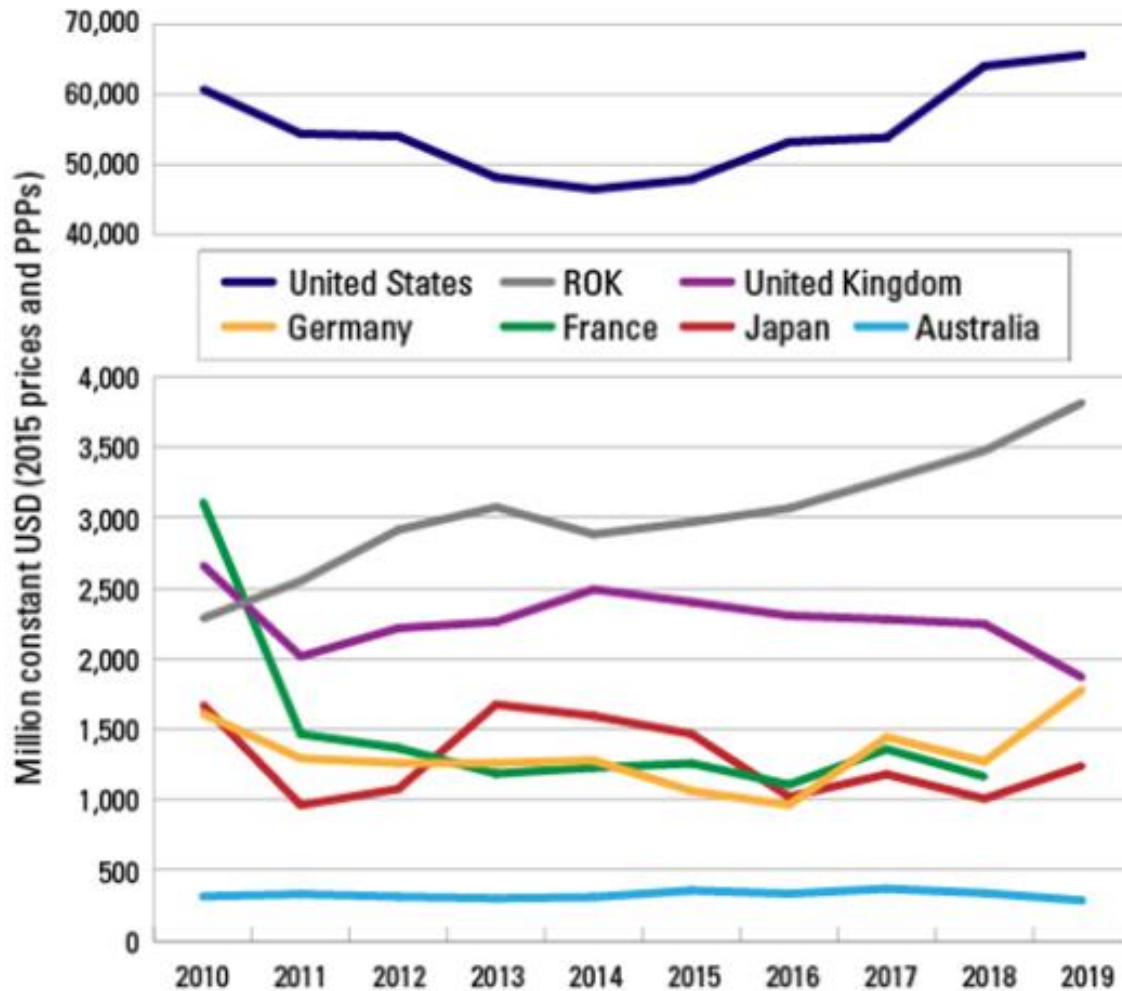
R&D Spending by Industry

Companies in the healthcare and software and Internet sectors demonstrated sustained growth in R&D spending, which has been increasing for years in both cases.



Source: Capital IQ data, Thomson Reuters Eikon data, Strategy& analysis

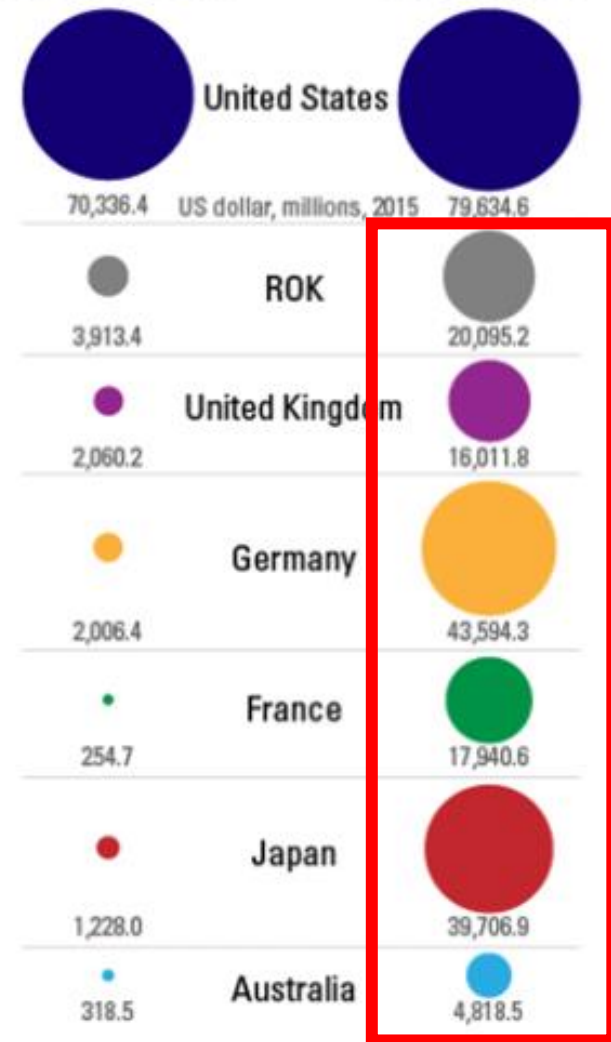
R&D funding for defence in selected OECD countries



Source: OECD

2019 Defence R&D

2019 Civil R&D



Source OECD

© IISS



from Net Politics and Digital and Cyberspace Policy Program

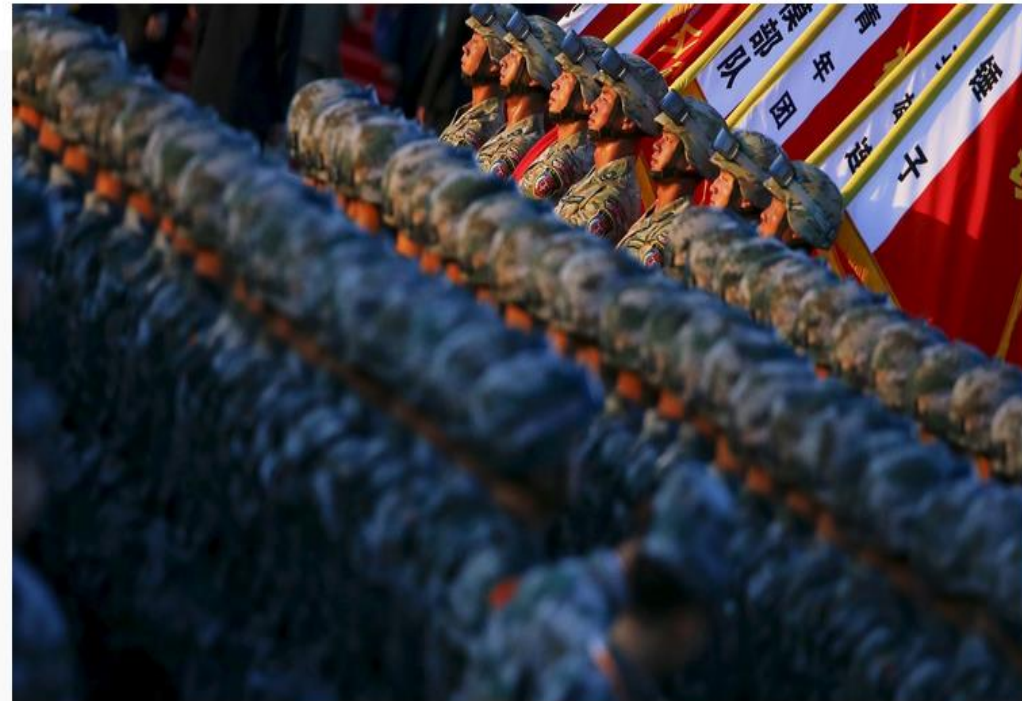
Civil-Military Fusion:

The Missing Link Between China's Technological and Military Rise

Many agree that China is becoming a technology and science superpower. How it translates that advantage into military power is another story.

Blog Post by Guest Blogger for Net Politics

January 29, 2018



Reuters / Damir Sagolj



Yuka Koshino
@YukaKoshino

Research Fellow for
Japanese Security and
Defence Policy

Is Japan ready for civil– military ‘integration’?

New initiatives to encourage ‘spin-ons’

“ [...] A pequena alocação de recursos ao Ministério da Defesa para pesquisa básica torna estas novas posições vitais para o Japão assegurar que a sua pesquisa de tecnologia avançada civil e comercial possa ser aproveitada para pesquisa e desenvolvimento em equipamentos de defesa, permitindo assim ao MoD acompanhar as tendências tecnológicas da guerra do futuro” (KOSHINO, 2021, tradução e grifos nossos).

“ATLA has also established a new position and a new division to accelerate the development of spin-ons: the Director for Advanced Technology Strategy and the Technology Collaboration Support Division. The former will monitor S&T trends both domestically and internationally. The latter aims to apply the outcomes of advanced basic research by academic institutions, industry and national research laboratories for defence purposes. The small funding allocation to the MoD for basic research makes these new positions vital for Japan to ensure that its civilian and commercial advanced technology research can be leveraged for R&D in defence equipment, so allowing the MOD to keep up with technology trends in future warfighting” (KOSHINO, 2021) - <https://www.iiss.org/blogs/analysis/2021/08/japan-civil-military-integration> .

The spin-on process: The symbiosis between technology spinoffs and spin-ons

JOURNAL OF STRATEGIC STUDIES
<https://doi.org/10.1080/01402390.2020.1852936>



ARTICLE



4IR technologies in the Israel Defence Forces: blurring traditional boundaries

Yoram Evron

ABSTRACT

This paper explores how Fourth Industrial Revolution (4IR) technologies obscure the traditional boundaries associated with the military realm. As the first examination of the conditions underlying the assimilation of 4IR technologies in Israel's armed forces, this paper makes several contributions. It expands the knowledge on the military assimilation of 4IR technologies and describes the interaction between military doctrine and technology using current evidence. It also enriches the evolving discussion on the strategic effect of emerging technologies. Finally, it demonstrates how emerging technologies involve neither straightforward spinoff or spin-on processes but a reciprocal transfer of know-how between the military and civilian sectors.

“A atividade de pesquisa e desenvolvimento civil é relevante para o setor de defesa nacional apenas enquanto existirem canais e condições de apoio para a transferência de know-how entre os setores”.

“De fato, tais condições são excelentes em Israel devido ao lugar central que as questões de defesa ocupam no país, e às firmes conexões entre os militares e o resto da vida nacional” (EVRON, 2020, p. 10, tradução e grifos nossos).

“Civilian research and development activity is relevant to the defence establishment only as long as channels and supporting conditions for the transfer of know-how between the sectors exist. Indeed, such conditions are excellent in Israel due to the central place that defence issues occupy in the country, and the firm connections between the military and the rest of Israeli life” (EVRON, 2020).

PONTO 4 DE 4

O PAPEL DOS ESTADOS/GOVERNOS
É FUNDAMENTAL PARA A INOVAÇÃO

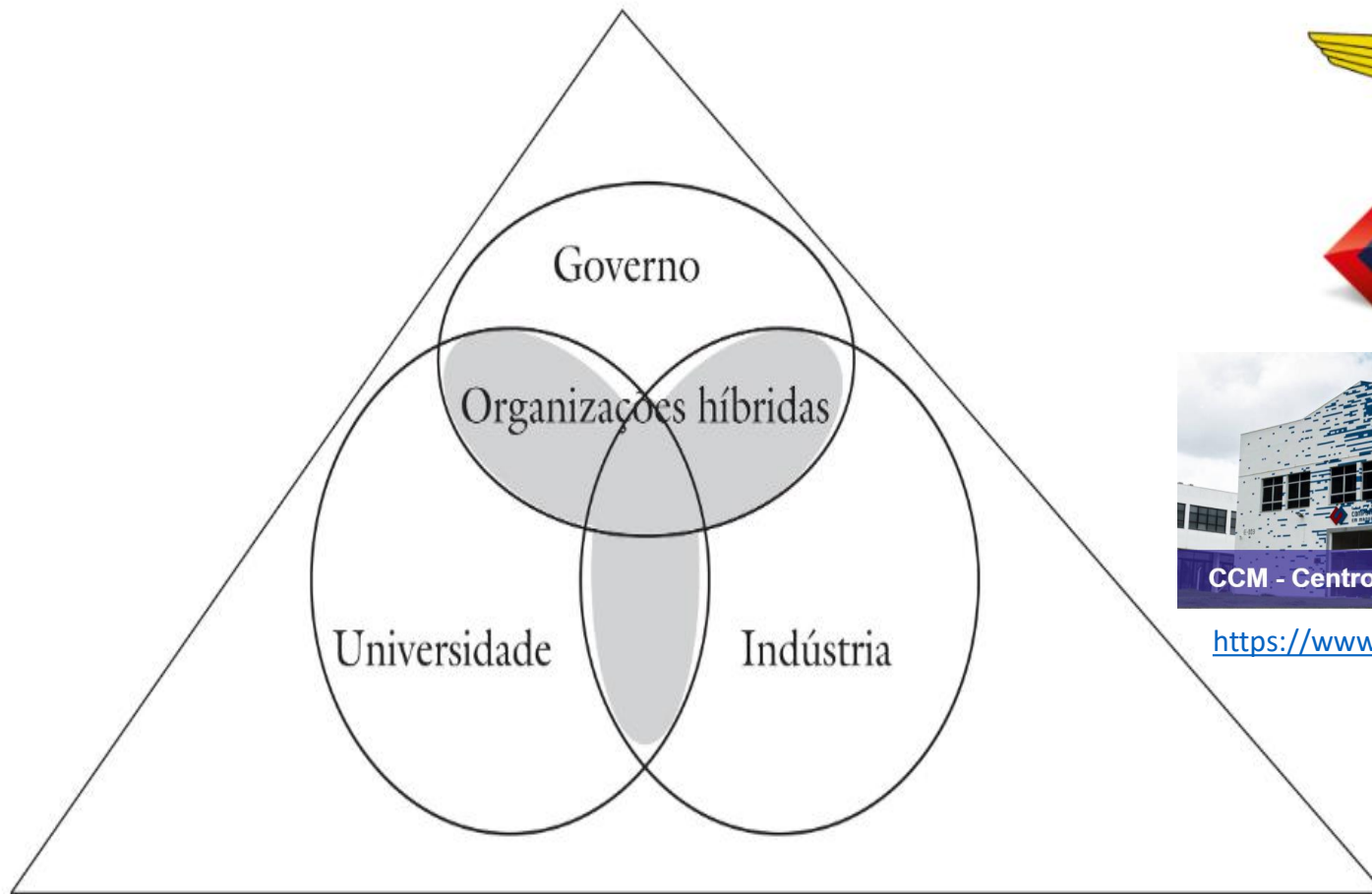
CONCEITO DE HÉLICE TRÍPLICE

- “Definimos a Hélice Tríplice como um modelo de inovação em que a **universidade/academia, a indústria e o governo**, como **esferas institucionais primárias**, interagem para promover o desenvolvimento por meio da inovação e do empreendedorismo”(ETZKOWITZ; ZHOU, 2017, grifo nosso)

CONCEITO DE HÉLICE TRÍPLICE

- “No processo de interação **novas instituições secundárias** são formadas conforme a demanda, isto é, **“organizações híbridas”**. A dinâmica das esferas institucionais para o desenvolvimento em uma hélice tríplice sintetizam o poder interno e o poder externo de suas interações” (ETZKOWITZ; ZHOU, 2017, grifo nosso)

CONCEITO DE HÉLICE TRÍPLICE



CCM - Centro De Competência Em Manufatura

<https://www.ccm.ita.br/index.php/pt/inicio/>

Figura 3 Estrutura social da Hélice Tríplice

Robotics hub trail-blazes for the Army's experimentation battlegroup

15 JUNE 2021



A new centre designed to supercharge the development of robotics technology is set to revolutionise the Army of the future.

Projects to be investigated at the outset include Remote Platoon Vehicles, nano Unmanned Air Systems, autonomous resupply of forward troops and how defence forms Human Machine Teams.

“Now the collaborative and agile-by-design approach of the ERCoE [Expeditionary Robotics Centre of Expertise] will use innovative **commercial models** to see Defence Equipment and Support (DE&S) working with experts from **Defence, Government, academia and Industry**. It will allow open access to information, fresh ideas and specialist knowledge which will result in the rapid growth of expertise”.



We are building a more secure world.

DIU strengthens our national security by accelerating the adoption of leading commercial technology throughout the military and growing the national security innovation base.

Defense Innovation Unit (DIU)

Accelerate DoD adoption
of commercial technology

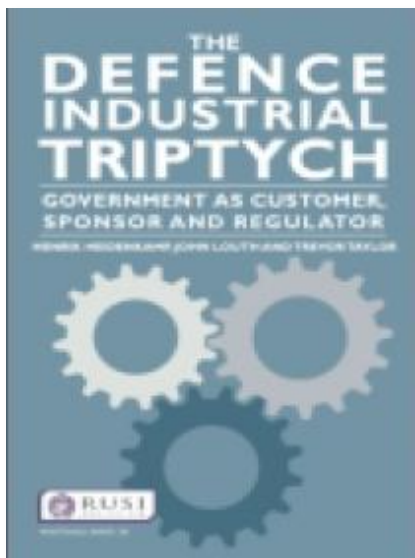
Transform military
capacity and capabilities

Strengthen the national
security innovation base

CONCEITO DE TRIPÉ DA INDÚSTRIA DE DEFESA

OS TRÊS PÁPEIS DO GOVERNO

Exemplo:



1. CLIENTE/COMPRADOR

Exemplo:

importância da previsibilidade das encomendas

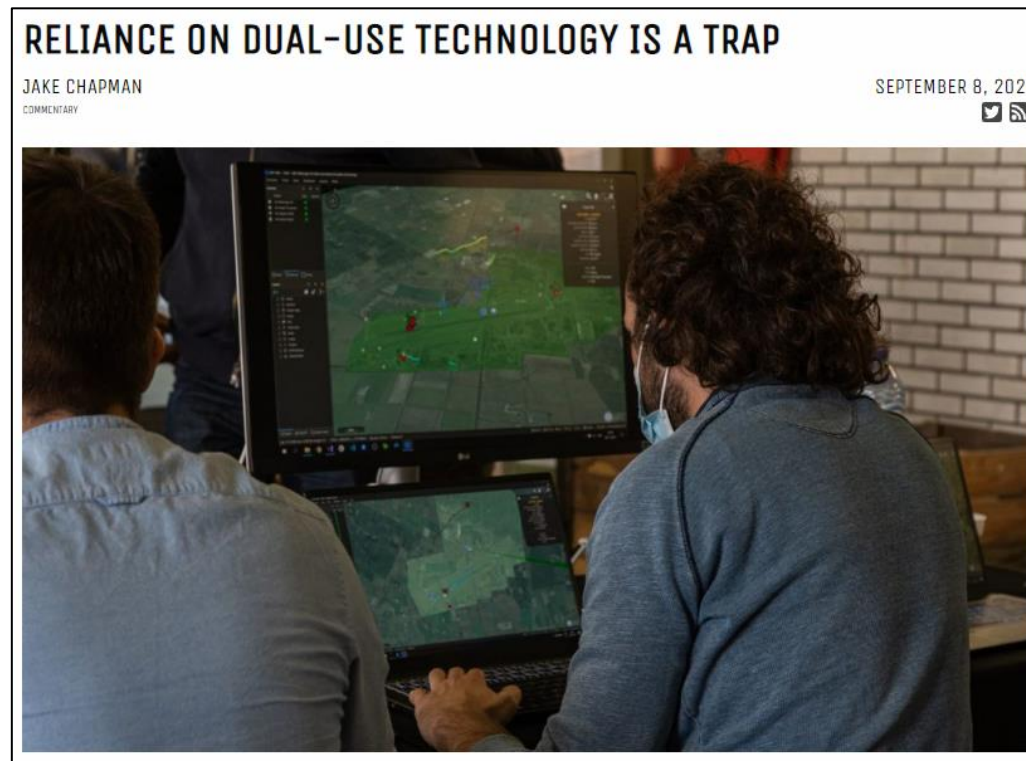
2. INCENTIVADOR

Exemplos: fundos para P&D e apoio para exportações

3. REGULADOR

Exemplos: por meio de leis, regulações e políticas públicas, controle de exportações, regulando fusões de empresas, protegendo tecnologias críticas etc.

“o modelo de **uso dual** tem o sua importância, *mas não deve ser mais a peça central dos nossos esforços de inovação em matéria de segurança nacional.* Uma melhor solução seria permitir aos empreendedores concentrarem-se na resolução dos **desafios da defesa**, tornando o Departamento de Defesa [EUA] um melhor **cliente.**”



“In short, the dual-use hack has its place, but should no longer be the centerpiece of our national security innovation efforts. A better solution would enable entrepreneurs to focus on solving defense challenges by making the Department of Defense a better customer. A first step would be to award larger contracts more quickly. The Department of Defense can also communicate better with the entrepreneurial ecosystem regarding current capabilities and problem sets, even if this means sharing more information than they are used to. This communication will serve to lower development risks and make agile, customer-centric development possible. Finally, the Defense Department should provide an incentive system and a clear process that drives successful development projects directly from research and development into acquisitions and sustainment” - <https://warontherocks.com/2022/09/reliance-on-dual-use-technology-is-a-trap/>

CONSIDERAÇÕES FINAIS

1. Importância de **canais, incentivos e condições de apoio** para a transferência de *know-how* entre os setores comerciais e de defesa;
2. Necessidade de **priorização** na gestão de recursos de defesa nacional (orçamento, tempo, pessoal etc.);
3. As grandes inovações estão ocorrendo no **setor civil**;
4. Poder de Compra do Estado/“**cliente**” é fundamental.

Obrigado!