Briefing to the 15th ARF Security Policy Conference
June 4, 2018

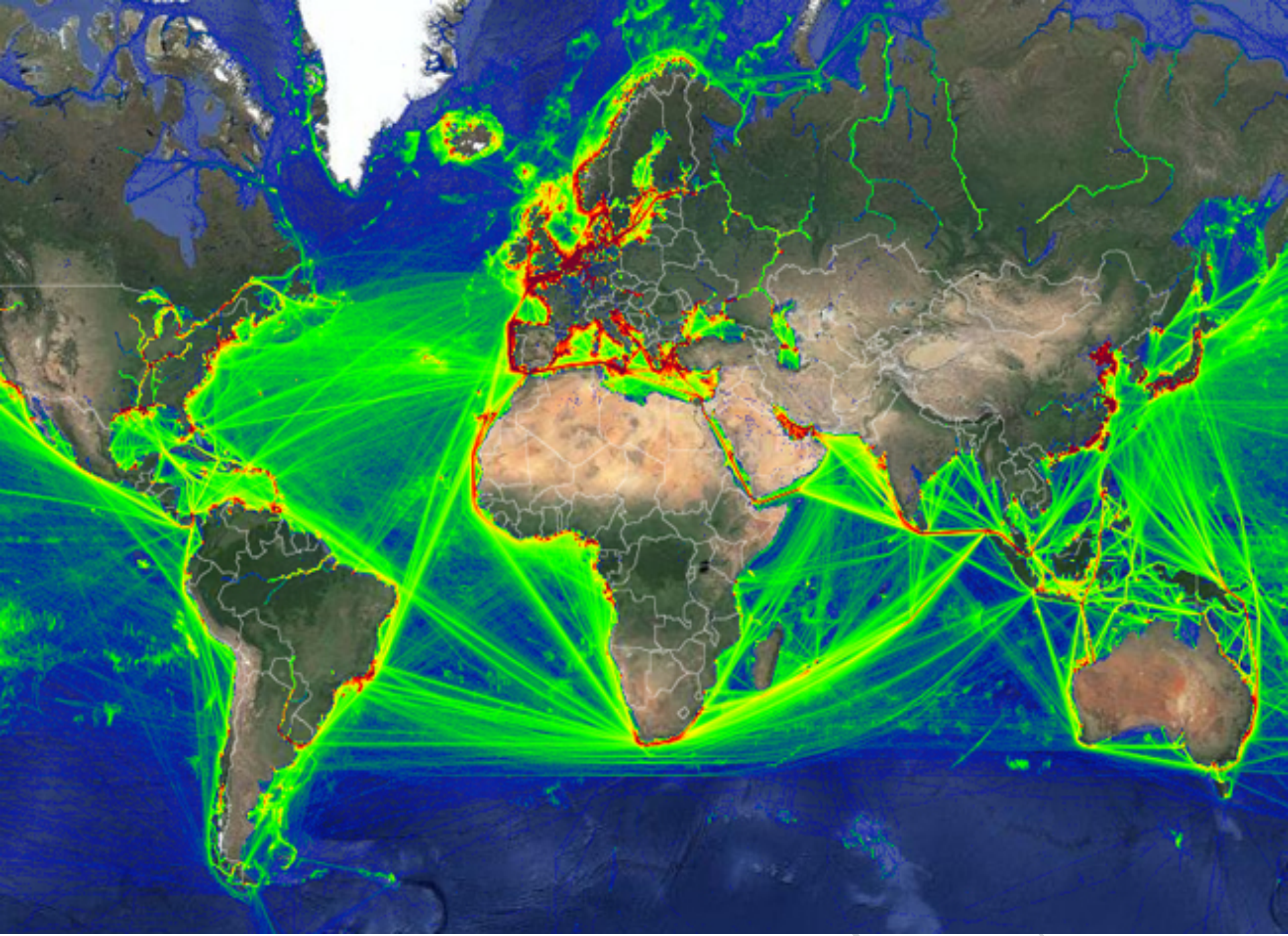
Disruptive Innovation and Maritime Security in the Asia-Pacific

Hybrid Threats in the Maritime Domain

Collin S.L. Koh
Maritime Security Programme

RSiS
Nanyang Technological University
S. RAJARATNAM SCHOOL OF INTERNATIONAL STUDIES


Myanmar (Burma)
Laos
Thailand
Vietnam
Cambodia
Bangkok
Phnom Penh
Andaman Sea
Gulf of Thailand
Malaysia
Kuala Lumpur
Singapore
Indonesia
Brunei
Philippines
Manila
Sulu Sea
Celebes Sea
Java Sea
Jakarta
Bay of Bengal
Sri Lanka
Colombo
Maldives
US Dept of State Geographer
© 2018 Google
Image Landsat / Copernicus
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Google Earth



Source: *MarineTraffic.com*, at: https://www.marinetraffic.com/en/ais/home/

Disruptive Innovation

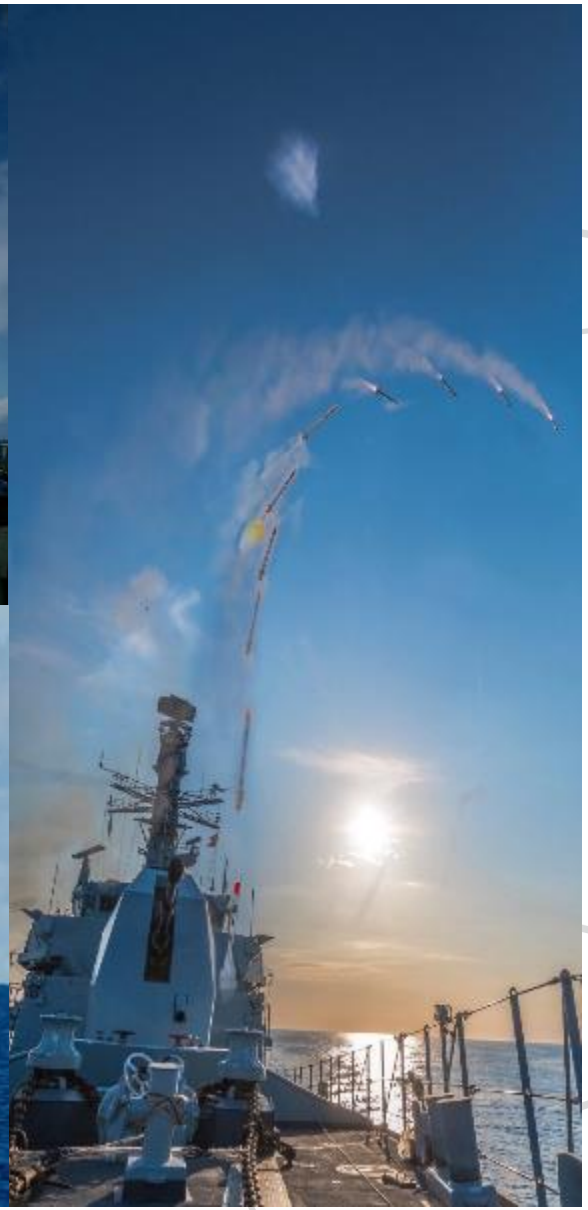
The Maritime Dimension

RSiS
Nanyang Technological University
S. RAJARATNAM SCHOOL OF INTERNATIONAL STUDIES

Modern Missile Age Warfare at Sea











The Washington Post
Democracy Dies in Darkness

Ad closed by Google
Report this ad | Why this ad?

IRAQI MINES IN PERSIAN GULF DAMAGE 2 U.S. WARSHIPS

By Caryle Murphy February 19, 1991

DHAHRAN, SAUDI ARABIA, FEB. 18 -- Two U.S. warships, including a guided-missile cruiser, were damaged and seven crewmen injured by Iraqi mines early this morning in the northern Persian Gulf, U.S. military officials said.

The explosions marked the first time in the Persian Gulf War that ships of the multinational naval force in the waterway have struck mines laid by Iraq.



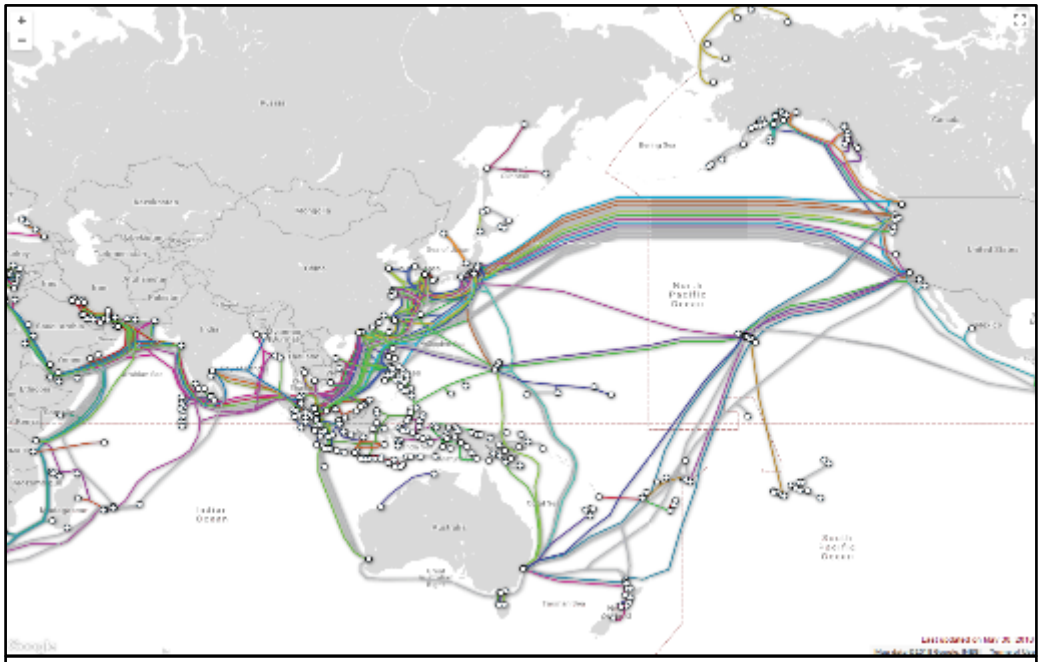




The naval mine remains an ubiquitous form of armament, especially for the weaker party. It is one of the asymmetric responses to technologically superior naval adversary. The aim may not necessarily be to sink the high-tech target but cause sufficient damage to result in a “mission kill”.

“Technicals” at Sea Pose a Challenge in Littoral Chokepoints







Undersea communications cables that are so crucial for modern commerce and trade can be disrupted, resulting in potentially colossal ramifications for economic, political and societal stability

UT News
The University of Texas at Austin

SCIENCE & TECHNOLOGY | HEALTH & WELLNESS | ARTS & HUMANITIES | EDUCATION & LEADERSHIP | BUSINESS & ECONOMY

UT News > Press Releases > UT Austin Researchers Successfully Spoof an $80 million Yacht at Sea

UT Austin Researchers Successfully Spoof an $80 million Yacht at Sea

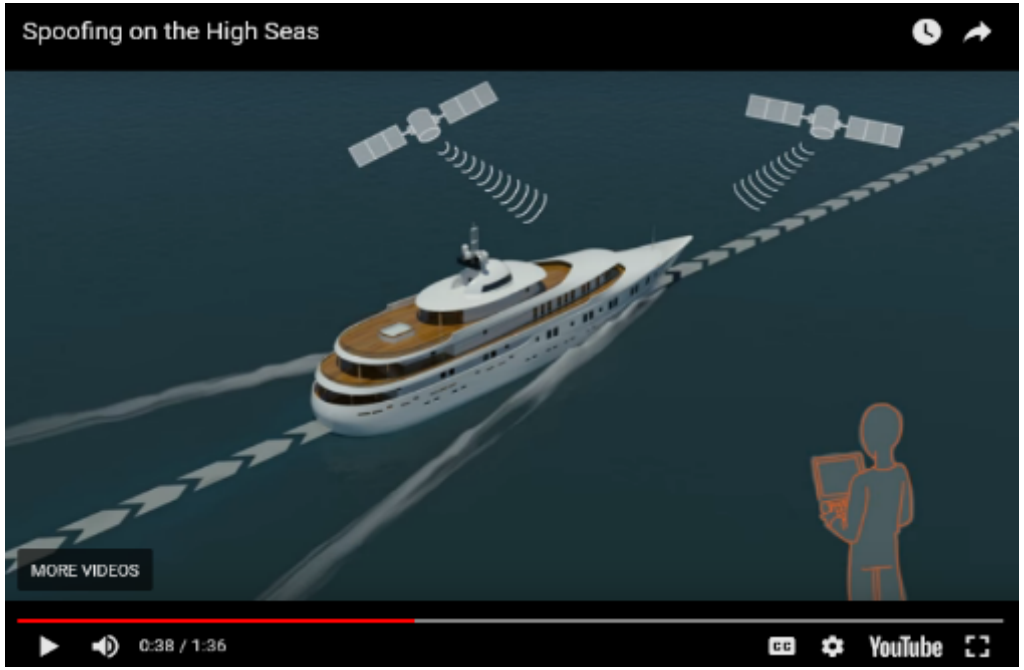
July 29, 2013

Email | Facebook | Twitter | LinkedIn | Google+ | More

This summer, a radio navigation research team from The University of Texas at Austin set out to discover whether they could subtly coerce a 213-foot yacht off its course, using a custom-made GPS device.

Led by assistant professor Todd Humphreys of the Department of Aerospace Engineering and Engineering Mechanics at the Cockrell School of Engineering, the team was able to successfully spoof an $80 million private yacht using the world's first openly acknowledged GPS spoofing device. Spoofing is a technique that creates false civil GPS signals to gain control of a vessel's GPS receivers. The purpose of the experiment was to measure the difficulty of carrying out a spoofing attack at sea and to determine how easily sensors in the ship's command room could identify the threat.

The researchers hope their demonstration will shed light on the perils of navigation attacks, serving as evidence that spoofing is a serious threat to marine vessels and other forms of transportation. Last year, Humphreys and a group of students led the first public capture of a GPS-guided unmanned aerial vehicle (UAV), or drone, using a GPS device created by Humphreys and his students.

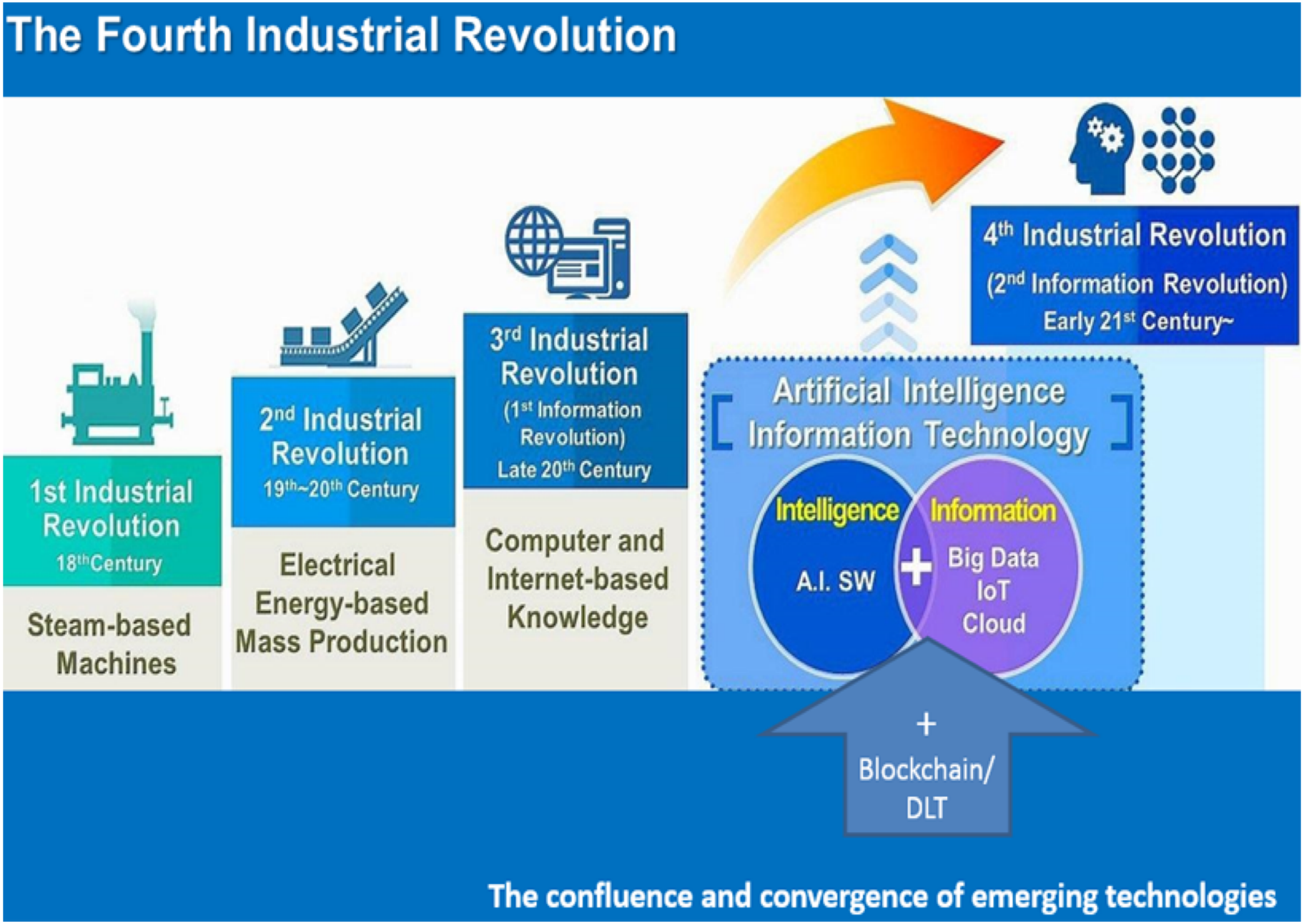


Home-built GPS spoofing capabilities pose a direct challenge to marine navigational safety, especially in geographically constricted littorals characterized by dense maritime traffic

Emerging Maritime Hybrid Threats

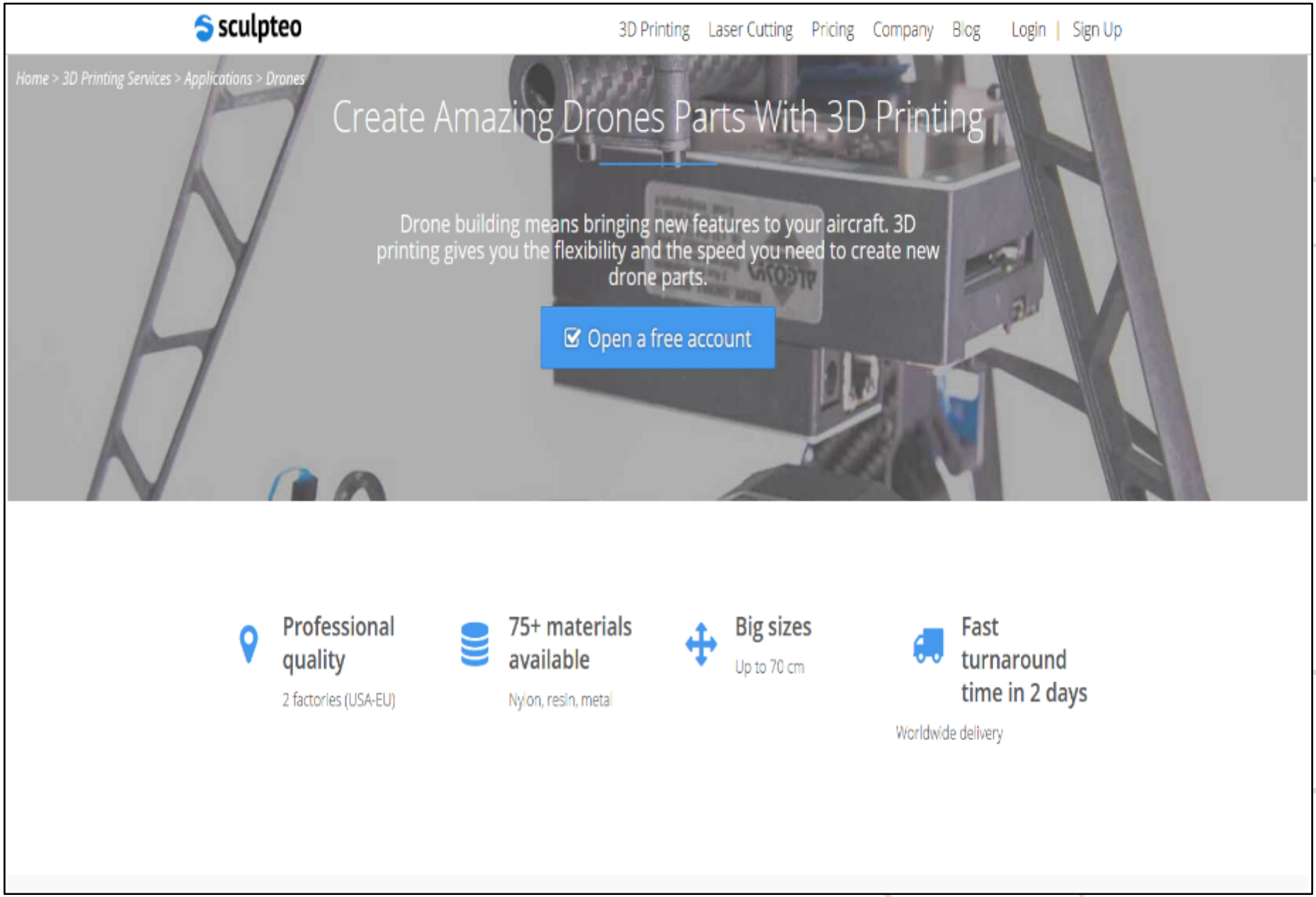
Additive Manufacturing and Unmanned Systems

RSiS
Nanyang Technological University
S. RAJARATNAM SCHOOL OF INTERNATIONAL STUDIES

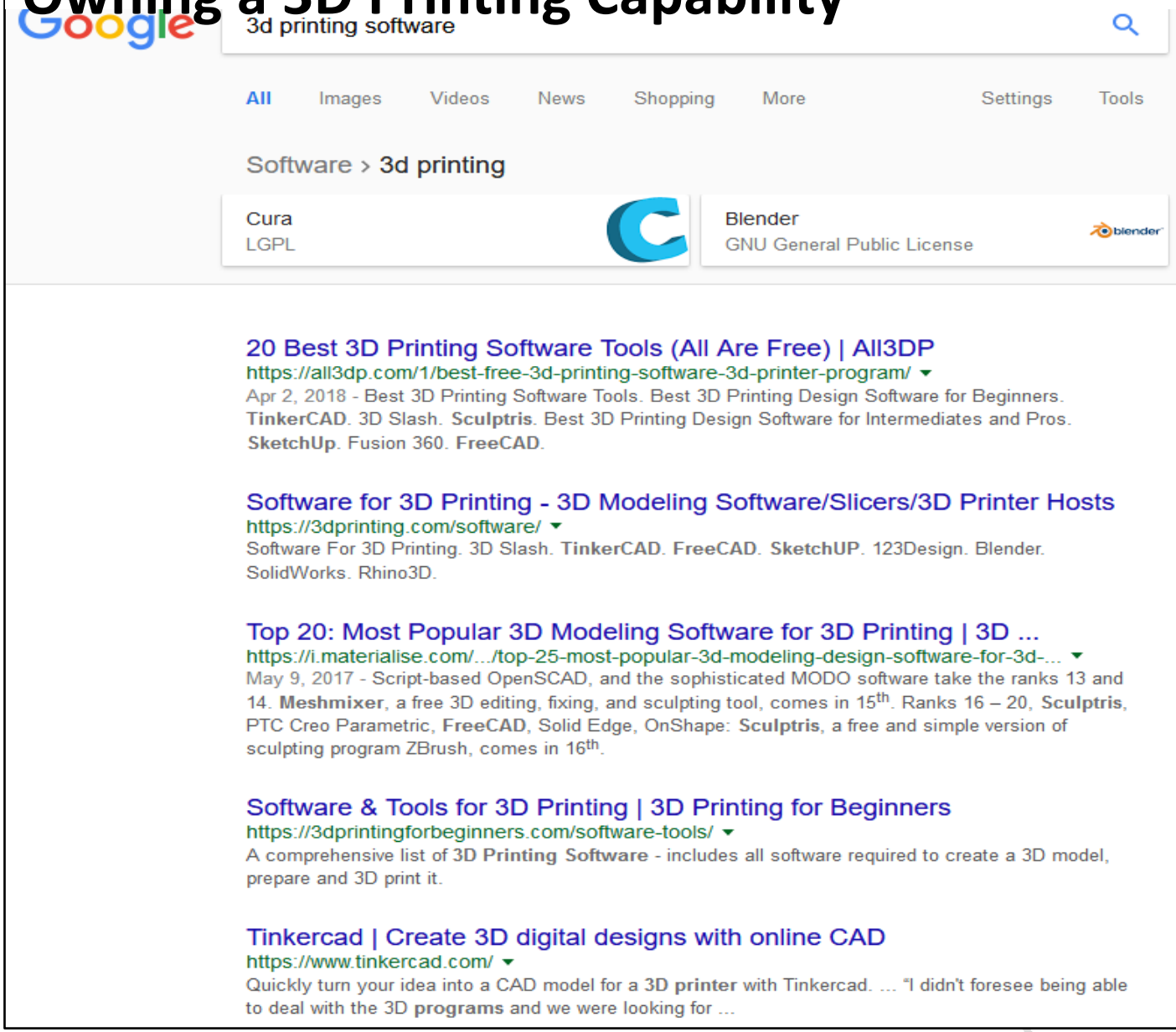


Source: Huawei. http://www.huawei.com/en/about-huawei/publications/winwin-magazine/29/accelerating-success-in-the-4th-industrial-revolution

Engage a One-stop 3D Printing Service Online…

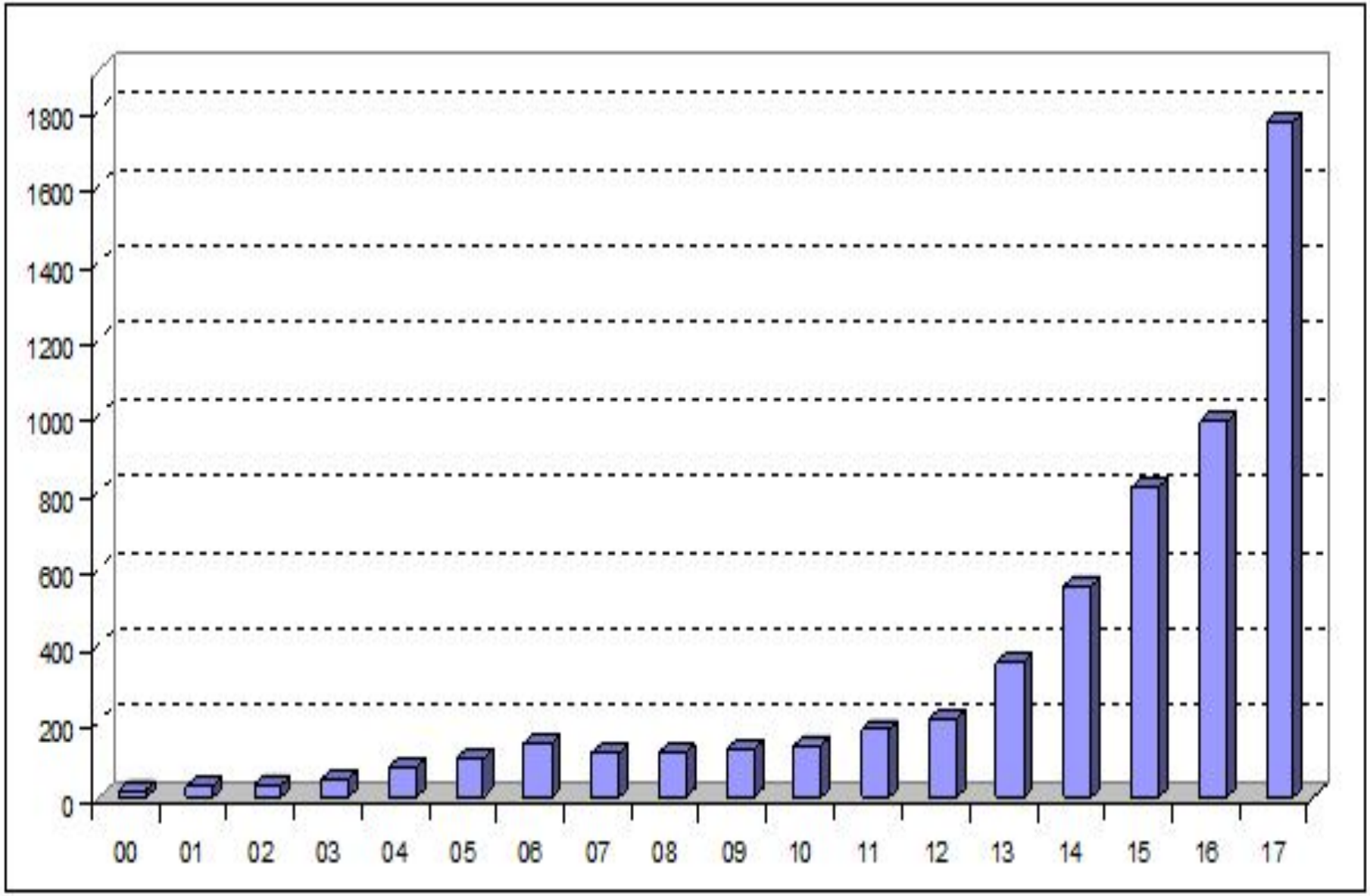


Simple Google Search Marks the First Easy Step to Owning a 3D Printing Capability



Your Very Own Metal 3D Printer at Home, for Only $3,000





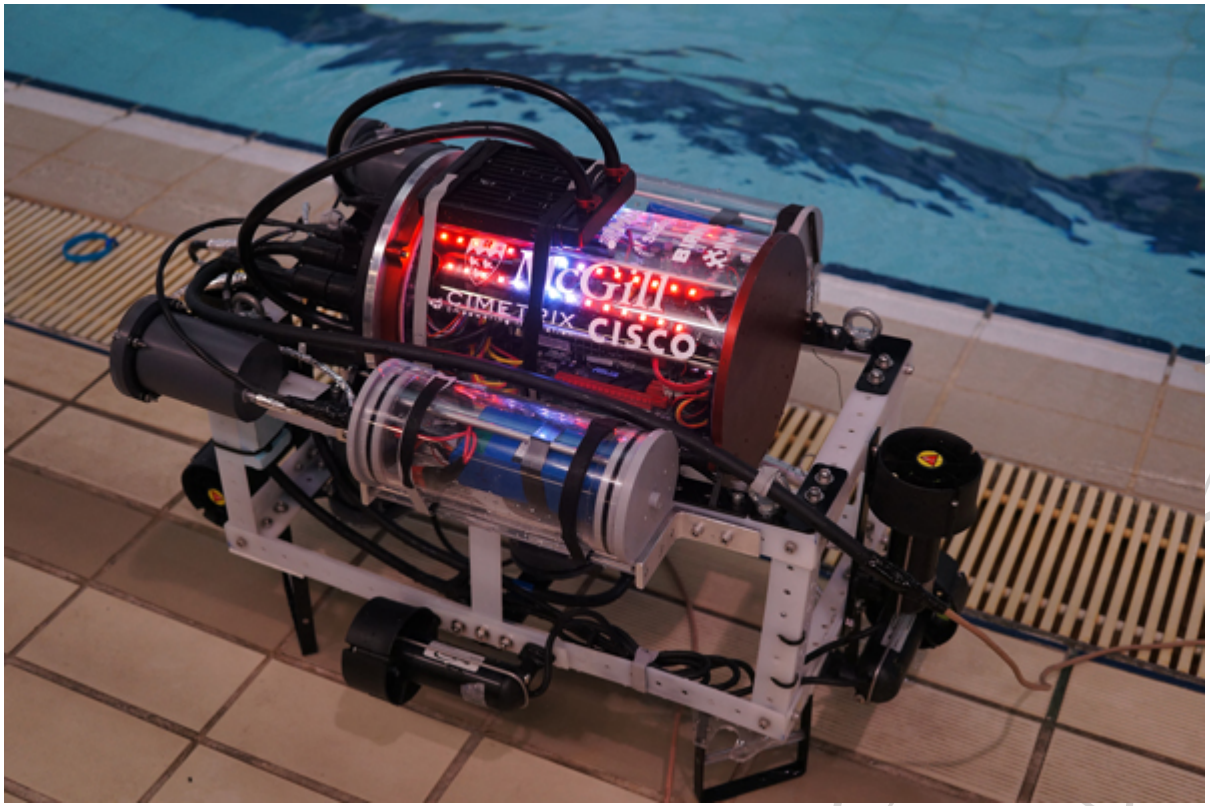
Dramatic rise in metal AM system sales

Source: Wohlers Report 2018

Sales of metal AM systems saw an increase of nearly 80% in 2017, with an estimated 1,768 metal AM systems sold throughout the year compared to 983 systems in 2016.

The Security Implications Are Significant

- Violent extremist organizations may be more capable of producing what they need through AM which allows them to sidestep transactions related to weapon sales and other material acquisitions, thereby making detection, tracking and disruption of such activities by law enforcement and intelligence agencies difficult
- AM may make attacks deadlier and more common
- Disposable, untraceable communication systems, as well as cheap decoys and other jamming devices that can be produced by AM can increase difficulties of counter-terrorism
- Lone-wolf attacks may become more lethal if individuals have ready access to AM printers



Asimov, developed by McGill Robotics, weighs 48 pounds and cruises at a top speed of 1.5 knots. The vehicle features six thrusters, holds several external manipulators, and boasts an array of sensors, artificial intelligence, and advanced computer vision systems. The integrated electrical, mechanical, computer and control systems are housed within a cylindrical pressure vessel. Some 100 students were recruited, divided into the sub-groups of electrical, mechanical and software engineering. The fall of 2013 was dedicated to the design phase and to researching different technologies that could meet the functional requirements. Asimov was then built over winter and pool-tested in March 2014.



Corrosion Resistant Aerial Covert Unmanned Nautical System — or CRACUNS — is a submersible UAV that can be launched from a fixed position underwater, or from an unmanned underwater vehicle (UUV), developed by Johns Hopkins University's Applied Physics Laboratory.



Data Diver, developed by Apium, is a prototype swarm vehicle designed with specialized sensor payloads for oceanography, aquaculture, hydrographic survey and defense applications.



Emulating the Q-ship (submarine decoy vessels) deployed to protect merchantmen during the World Wars, today's maritime threat actors may make use of innocent-looking civilian vessels embedded within the dense maritime traffic to carry out attacks in conjunction with cheaply mass-produced unmanned systems, with potentially devastating consequences

"State sovereignty is predicated on a monopoly of force and, at a minimum, the capacity to regulate arms. AM will further relax this control, giving private citizens greater access to lethal weapons and other tools of violence... As AM printers and designs proliferate, the threat and cost of nonstate violence could grow dramatically. Even in relatively stable states, AM-produced weapons and other goods will flood black markets, giving criminal networks a new revenue stream."

RAND Corporation, 2018

Addressing the Challenge

Greater Emphasis on Multilateral and Multi-stakeholder Cooperation

RSiS
Nanyang Technological University
S. RAJARATNAM SCHOOL OF INTERNATIONAL STUDIES

Confronting Emerging Maritime Hybrid Threats

- Comprehensive, public-private partnership-based regulatory controls
  - e.g. because of the worldwide proliferation (including black market) and dual-use nature of additive manufacturing, unilateral measures will be ineffective
- Whole-of-government focused on prevention and cost mitigation
- Enhancement of existing frameworks for maritime situational awareness, information-sharing and intelligence exchange
  - Need to involve not only maritime agencies but land-based counterparts dealing with related aspects
- Review of the scope and complexity of multilateral training exercises involving multiple stakeholders
- Establishment of a region-wide hybrid threats fusion cell to correlate, analyze and share assessments of anomalous behaviors at sea
  - Ultimate goal: to create a common maritime threat picture for all regional governments

Building on Existing Regional Institutions





- Regional defense and security agencies possess requisite resources and expertise to play a primary role in tackling maritime hybrid threats
- Solutions to these challenges can potentially build on existing regional institutions at the policy and maritime practitioner levels
  - e.g. ARF, ADMM-Plus
  - e.g. Information Fusion Centre

Thank you!
Q&A

Email: iscollinkoh@ntu.edu.sg

RSiS
Nanyang Technological University
S. RAJARATNAM SCHOOL OF INTERNATIONAL STUDIES