
AN AUSTRALIAN SPACE INDUSTRIAL BASE –
GRAND STRATEGY, OR STRATEGY OF GRANDEUR ?
Darin Lovett, M.Phil, M.A, M.Sc, B.E
Space Support, AWC, WGCDR (Reserve)
Director Space, South Australian Space Industry Centre
Australian Space Industrial Base

RAAF
Air Power Development Centre

Development Cell has a forward-looking remit and is principally concerned with identifying and exploring the potential impact of technological, strategic, societal, or environmental disruptors, innovations, and drivers on the future of Australian air **[and space]** power. The mission of the Development Cell is to improve the ability of Air Force to prepare for and adapt to change and potential disruption by promoting the development of creative and critical approaches to anticipating future changes in the tactical, operational, and strategic environments.

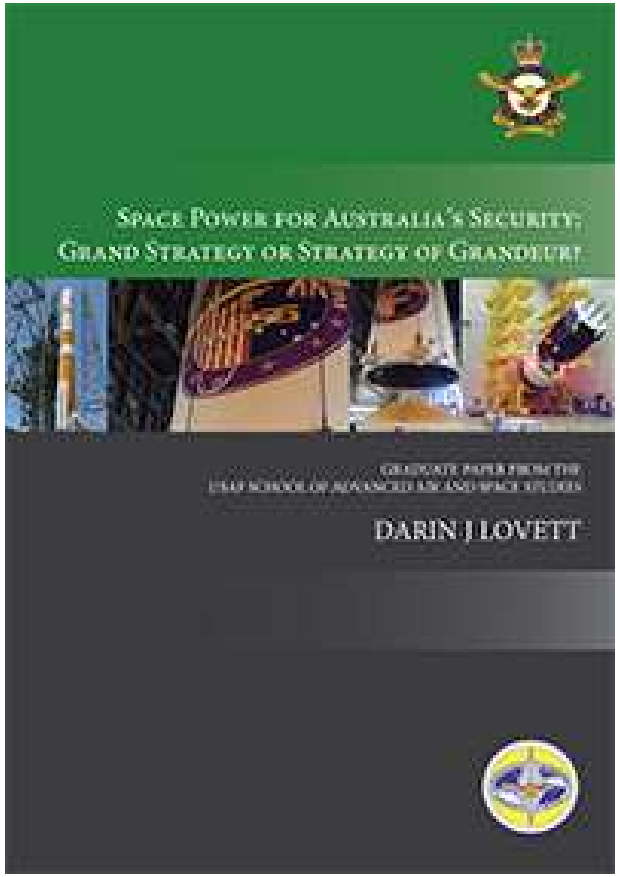
An Australian Space Industrial Base – grand strategy or strategy of grandeur?

Synopsis

- **It's a pivotal moment to be engaged in the space sector in Australia. Our small but dynamic space industry is growing, and billions of dollars in capital investment are slated for new Defence capabilities. However, despite laudable growth and investment, the recent COVID crisis has fundamentally altered the national economy and re-energised the discussion around sovereignty and resilience.**

The question we will consider is:

- **To what extent should Defence policy support an Australian Space Industrial Base**?



Outline

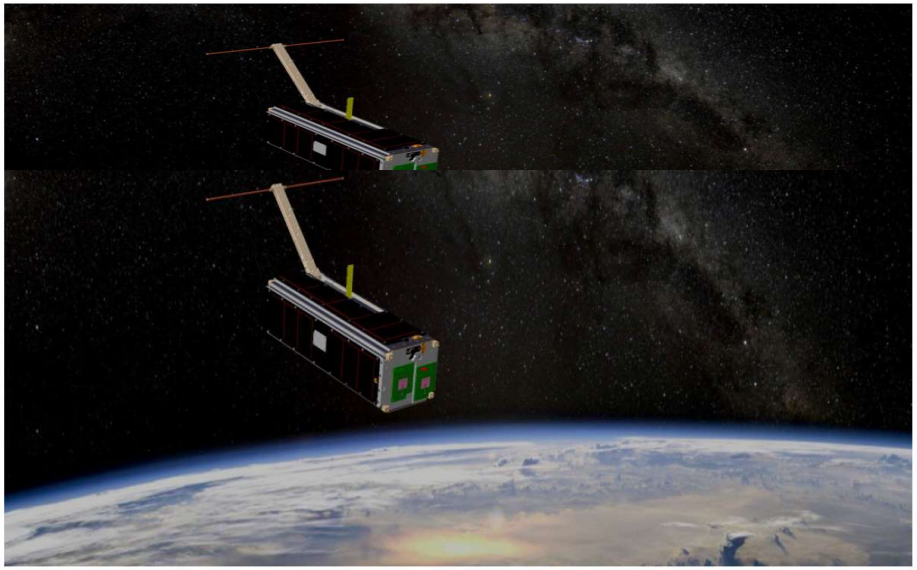
1. Impetus for change
2. Opportunity – New Space
3. Australian policy and strategy update
4. What could we do?
5. What are we doing

SIB - topical

ASPI AUSTRALIAN STRATEGIC POLICY INSTITUTE THE STRATEGIST

Towards a sovereign space capability for Australia's defence

3 Aug 2020 | Malcolm Davis (https://www.aspistrategist.org.au/author/malcolm-davis/)
Strategic update 2020 (/dinkus/strategic-update-2020/)



ceda
committee for economic development of australia

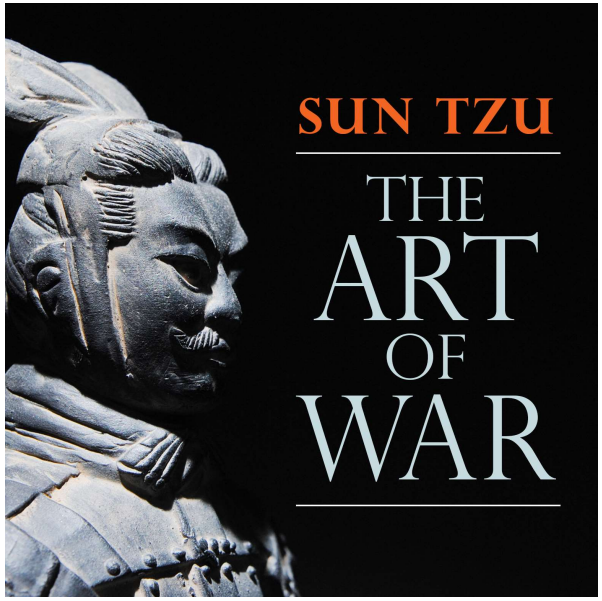
Australia's defence future - Ministers Reynolds and Price

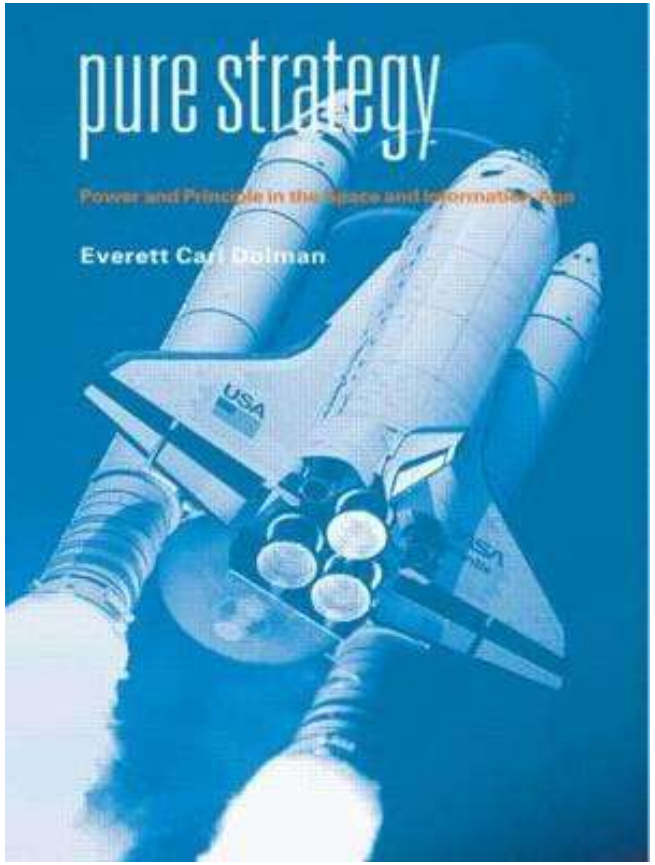
NAT
Aug 19

At this pivotal time in our economy and in the region join CEDA members from across the country to hear from Federal Ministers leading Australia's defence and defence industries.

- The future of Australia's sovereign defence capability
- What role the $270bn investment in defence and defence industries can play in Australia's economic recovery.
- The role of the private sector and Australia's institutions in protecting our businesses, individuals and communities.
- Opportunities for new collaboration and doing more business within existing strategic relationships and alliances.
- Australia's future role in the Indo-Pacific and the importance of key markets and trading partners.

Grand Strategy

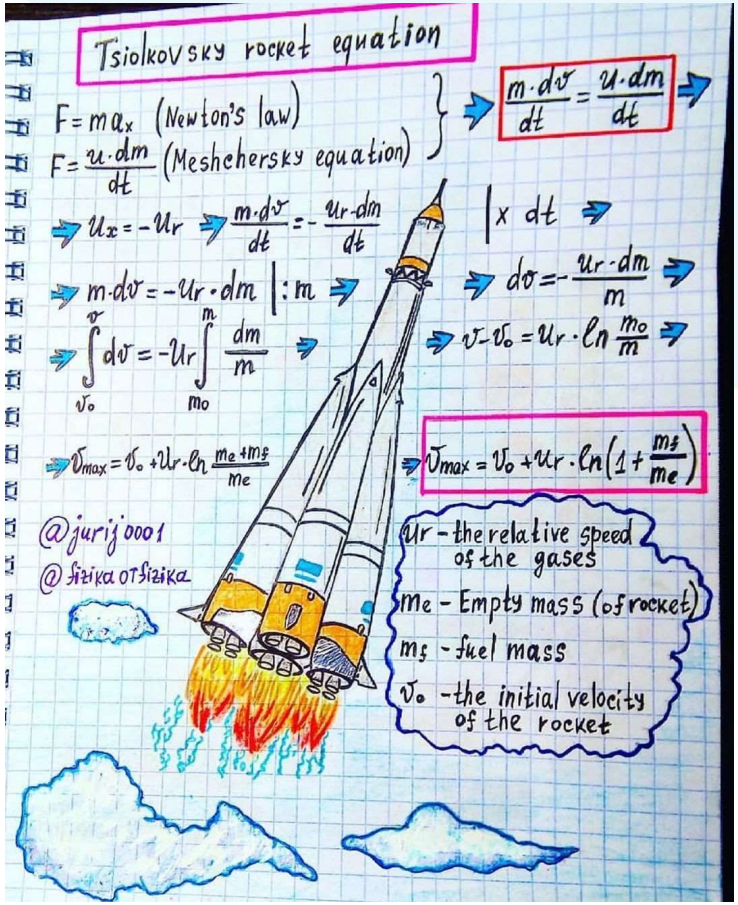


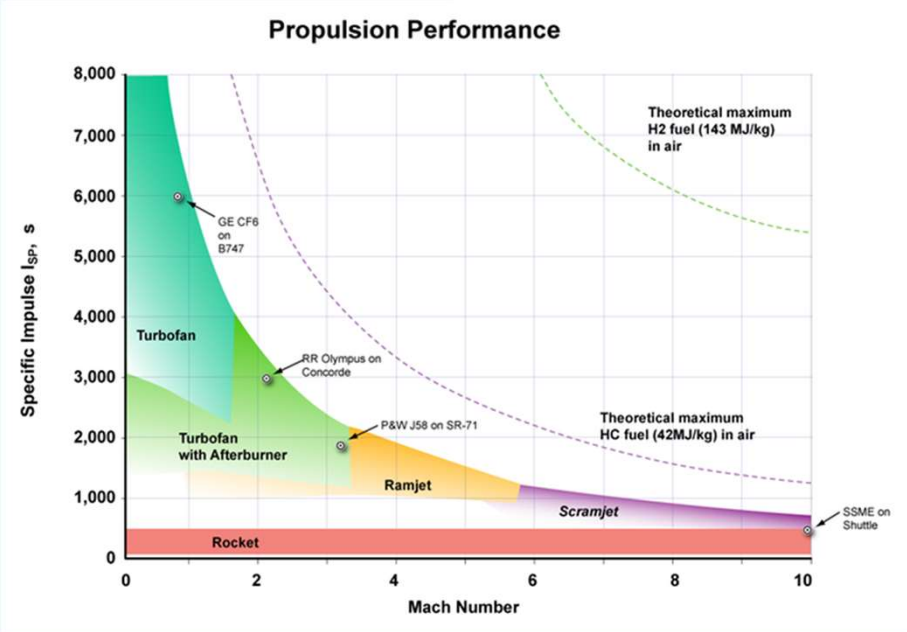


‘There can be no question of a purely military evaluation of a great strategic issue, nor of a purely military scheme to solve it’

Carl von Clausewitz

What this is not…

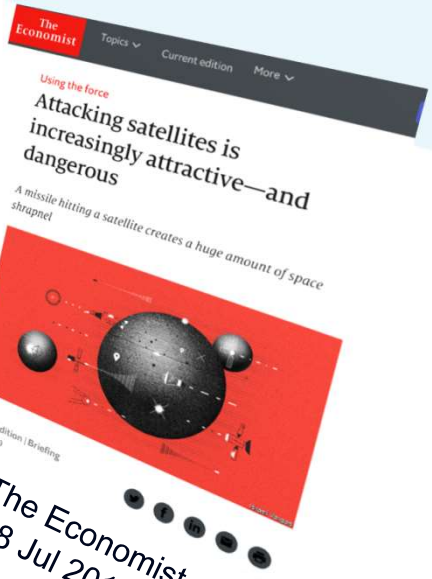




What's changed

Time magazine – Dec 1968

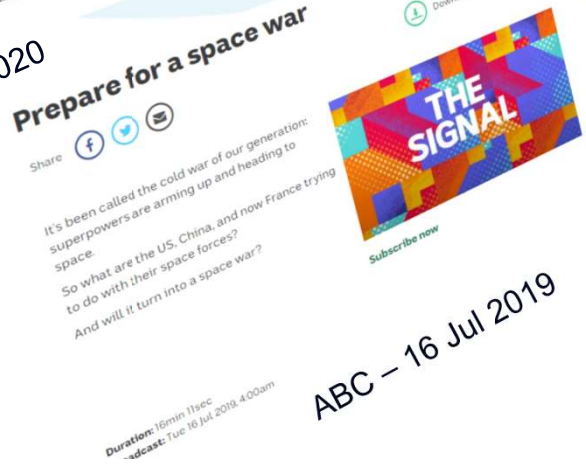
BBC – Sep 2017



The Economist – 18 Jul 2019

10 Feb 2020

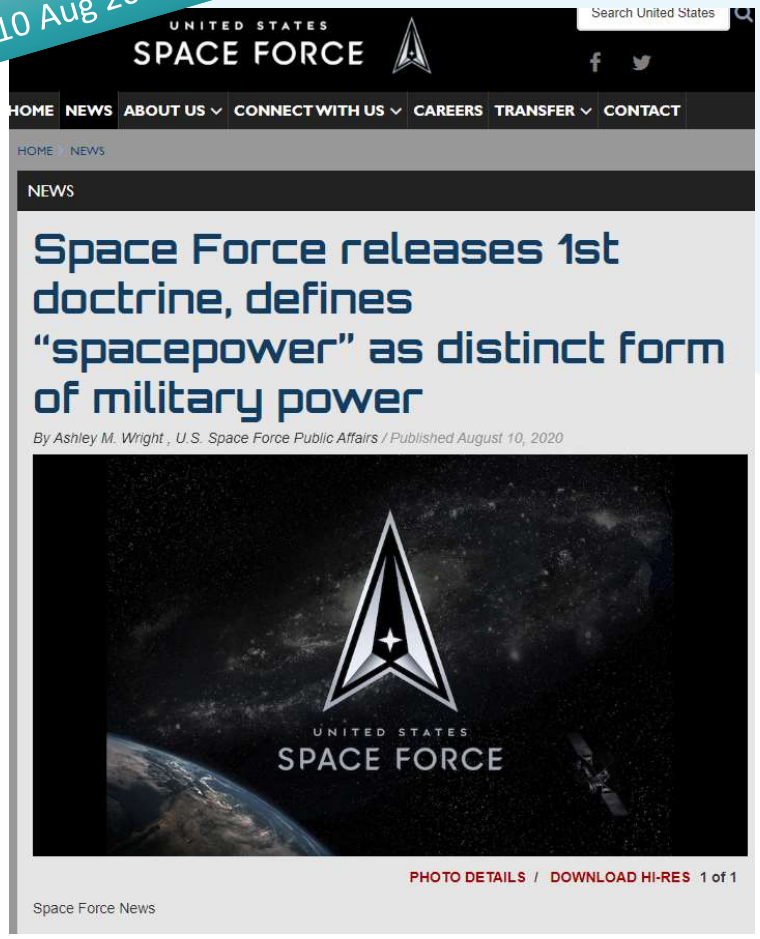
FT - 14 Jul 2019



ABC – 16 Jul 2019

Space as a domain

10 Aug 2020



https://www.spaceforce.mil/Portals/1/Space%20Capstone%20Publication_10%20Aug%202020.pdf

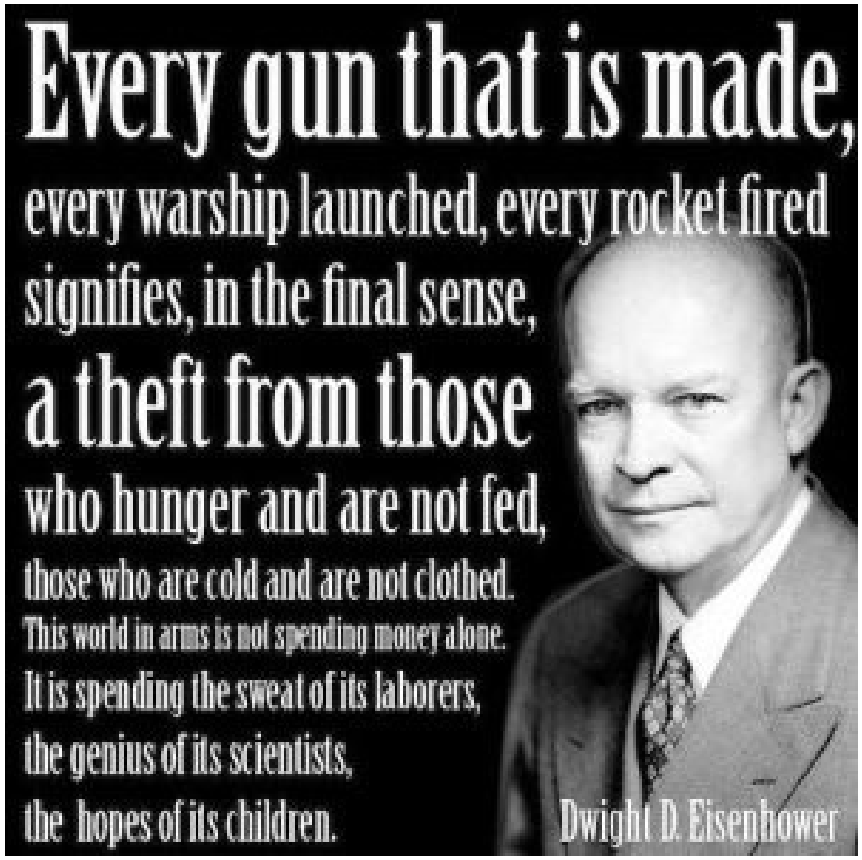
Dec 2019

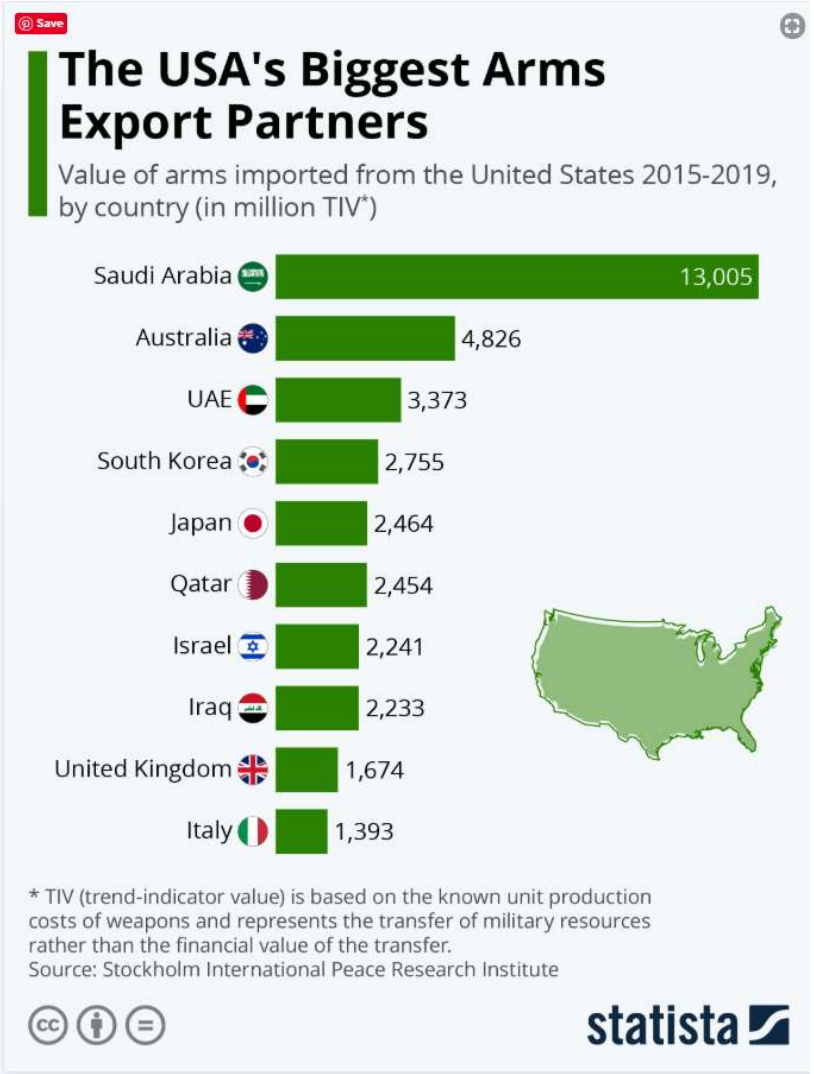
NATIONAL SPACEPOWER

National spacepower is the totality of a nation's ability to exploit the space domain in pursuit of prosperity and security. National spacepower is comparatively assessed as the relative strength of a state's ability to leverage the space domain for diplomatic, informational, military, and economic purposes.

- **Space exploration** strengthens diplomatic power by conferring national prestige and generating opportunities for peaceful multinational cooperation.
- **U.S. space-based remote sensing and communication** is an elemental component of the information power required to employ the other instruments of power.
- … **military spacepower** has become a prerequisite for global deterrence and power projection.
- The commercial **space industry** is a top priority and highlights dynamic partnerships between government and commercial partners as essential to our economic prosperity, national security and scientific knowledge..

Balanced investment





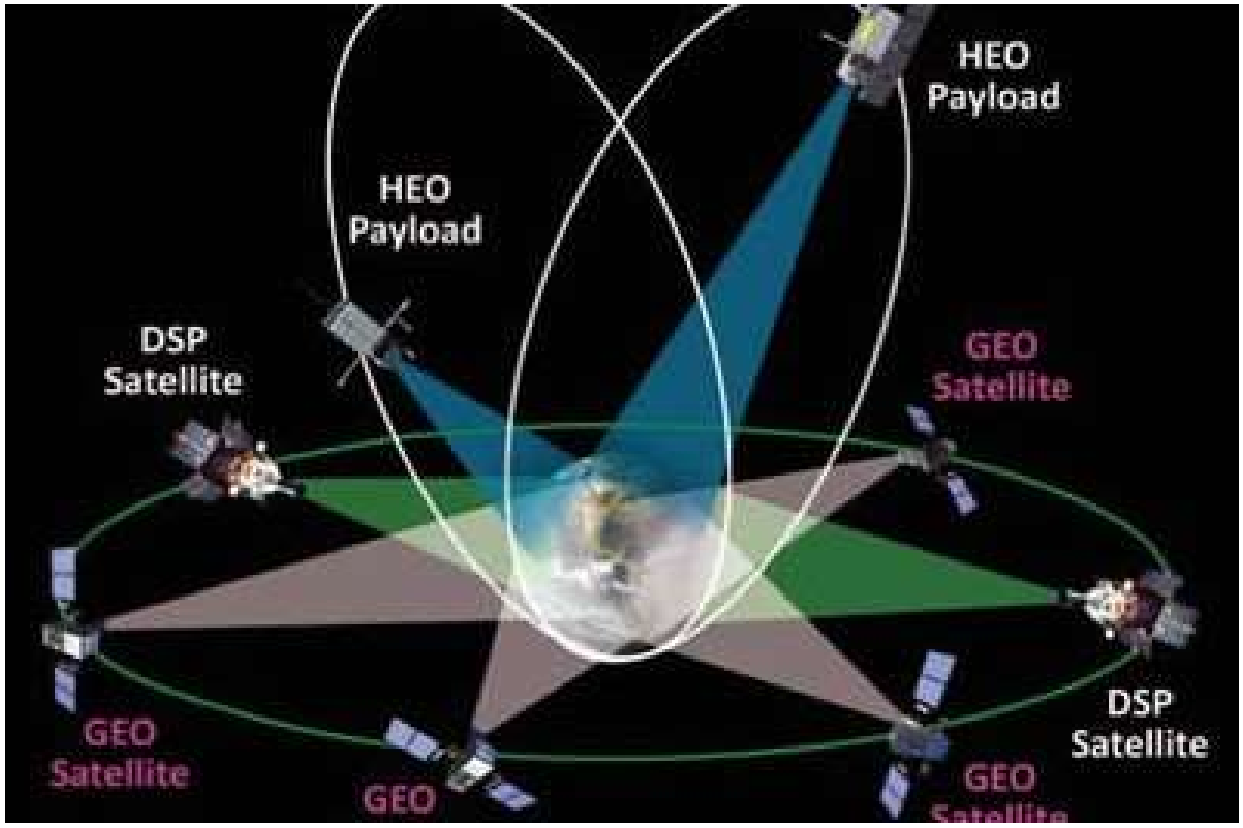
https://www.statista.com/chart/12205/the-usas-biggest-arms-export-partners/

Space – How we've done it for 50 years

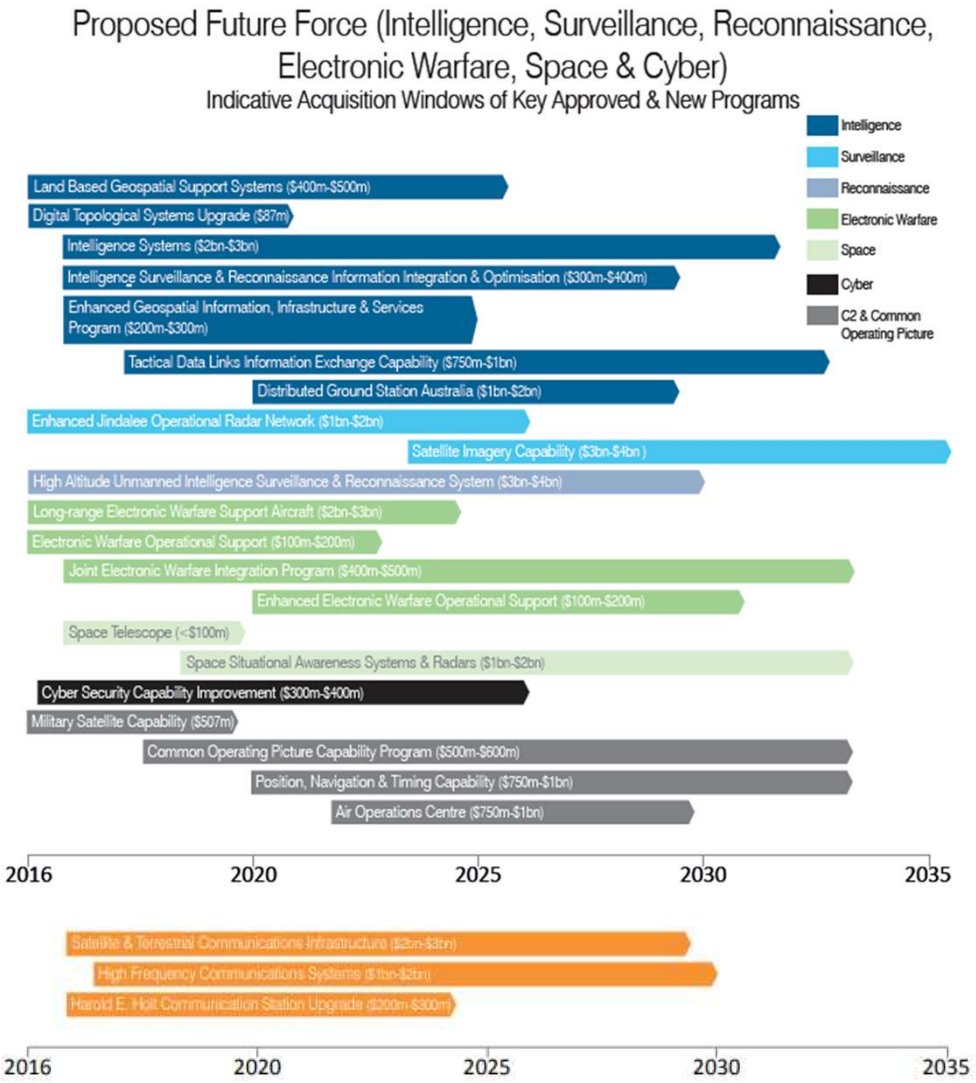
Pentagon

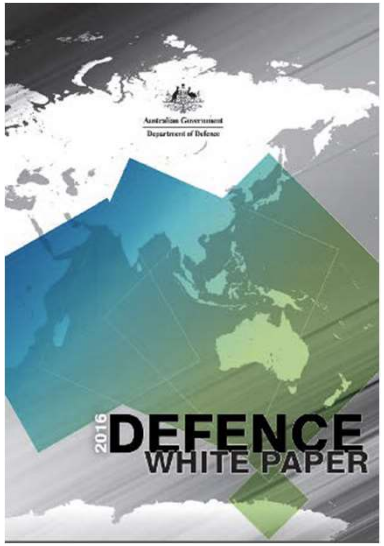
'Unbelievably ridiculous': Four-star general seeks to clean up Pentagon's classification process

By: Aaron Mehta January 29



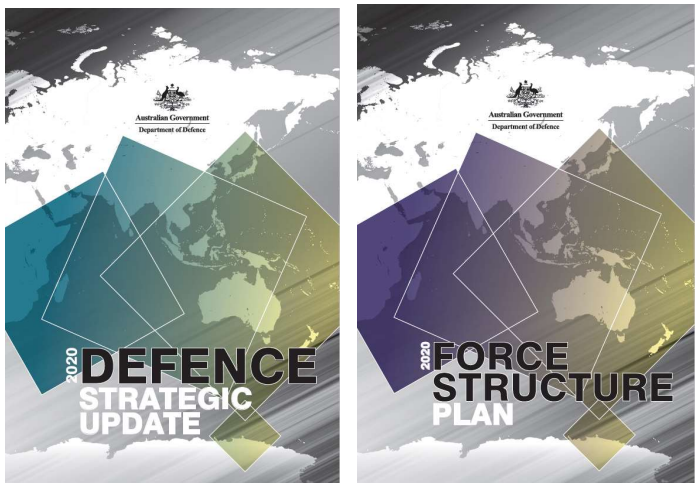
Policy 2016

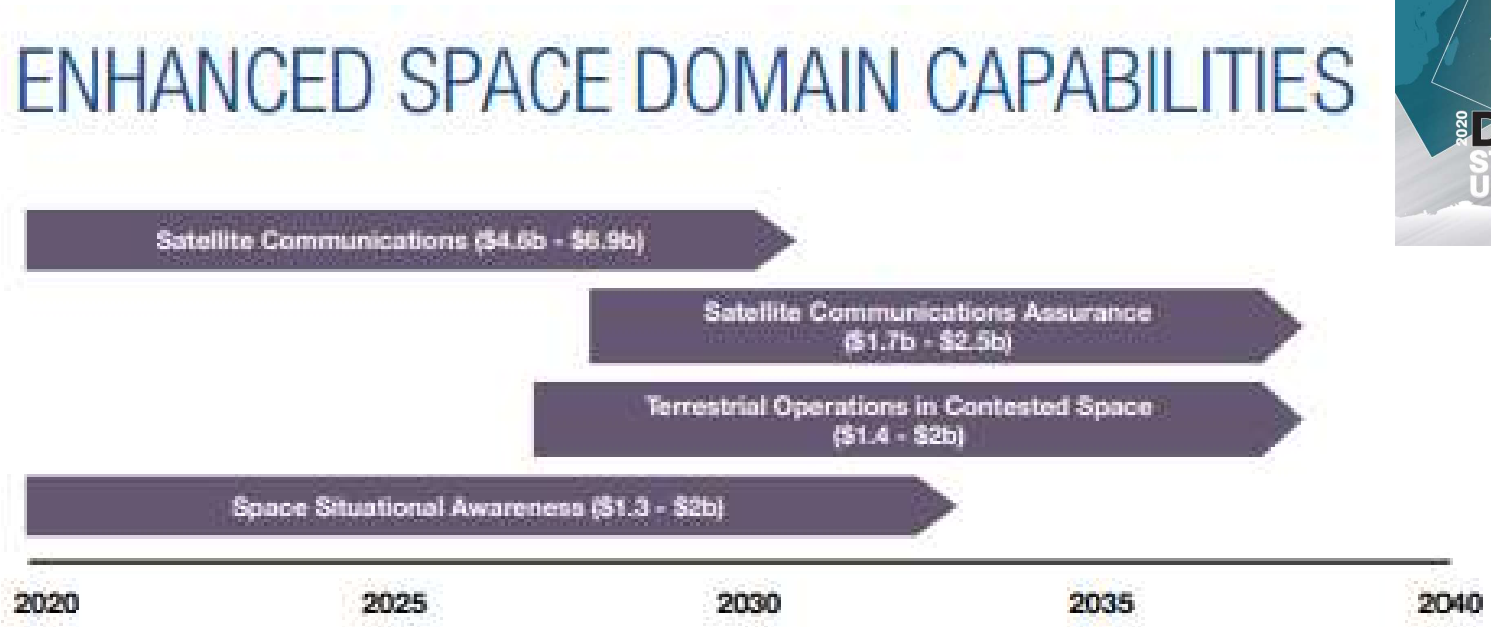




Last DWP/IIP 2016
2016 to 2019 ~ AUD $600m
2019 to 2029 ~ AUD $5-$6bn

Policy 2020





https://www.defence.gov.au/StrategicUpdate-2020/docs/Factsheet_Space.pdf

Policy 2020

OPPORTUNITIES FOR AUSTRALIAN DEFENCE INDUSTRY

Plans for communications satellites and ground control stations under sovereign Australian control will provide opportunities for Australian companies.

CAPABILITY INVESTMENT – APPROXIMATELY $7 BILLION

Space Services

Continued investment in a rolling upgrade program to **assure** position, navigation and timing information in a contested environment.

Investment in upgrades and support to existing and future **satellite communications** systems, including communications satellites and ground control stations that will be under sovereign Australian control.

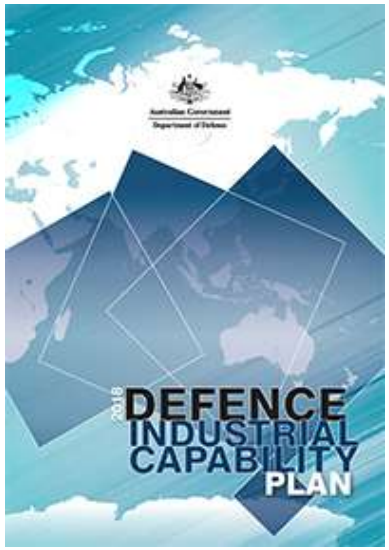
Space Control

Continued investment to build our space domain awareness capabilities, also known as **space situational awareness**, with the United States and other key partners.

Using **terrestrial** and/or space-based systems, new investments will be made in capabilities to counter emerging space threats and assure our continued access to space-based intelligence, surveillance and reconnaissance.

Sovereign Industrial Capability Priorities

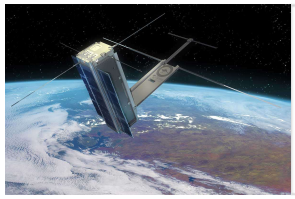
- Sovereign Industrial Capability Priorities are:
  - Collins Class Submarine maintenance and technology upgrade
  - Continuous Shipbuilding Program (including rolling submarine acquisition)
  - Land Combat Vehicle and technology upgrade
  - Enhanced Active and Passive Phased Array Radar Capability
  - combat clothing survivability and signature reduction technologies
  - advanced signal processing capability in Electronic Warfare, Cyber and Information Security, and Signature Management technologies and operations
  - surveillance and intelligence data collection, analysis, dissemination and complex systems integration
  - test, evaluation, certification and systems assurance
  - munitions and small arms research, design, development and manufacture
  - aerospace platform deep maintenance

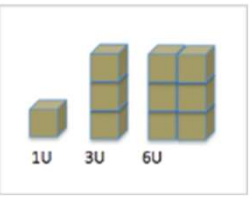


Where's Space ?

https://www.defence.gov.au/spi/industry/capabilityplan/Docs/SICP-Factsheet1.pdf

New Space





CUBESAT
1 U = 10 x 10 x 10 cm
3U = 3 stacked 1U
6U = 2 stacks of 3U's

Smallsat Trends (2012 – 2019)
Highlights

1,700+ smallsats launched

52% of smallsats provide commercial services

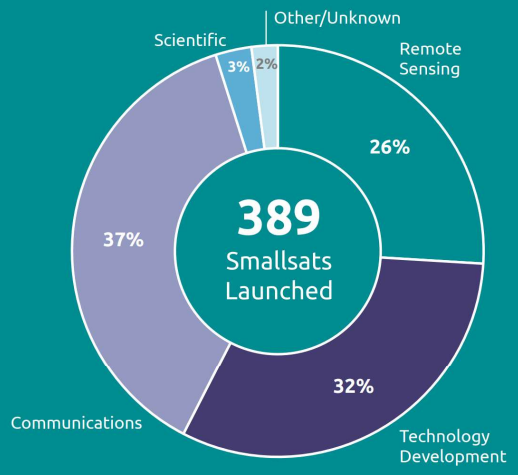
11x increase in proportion of upmass represented by smallsats over 7 years

Smallsat usage began to increase in 2012

Government and commercial sectors are increasingly using smallsats

2019 Smallsat Highlights

BRYCE space and technology



Smallsats by Use

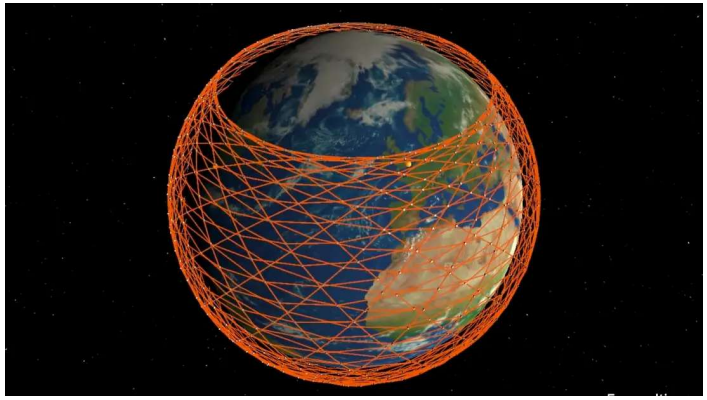
109 kg average smallsat mass, nearly 2x increase from 2018, 6x increase from 2017

45% of launches included smallsats, nearly doubling from 24% in 2012

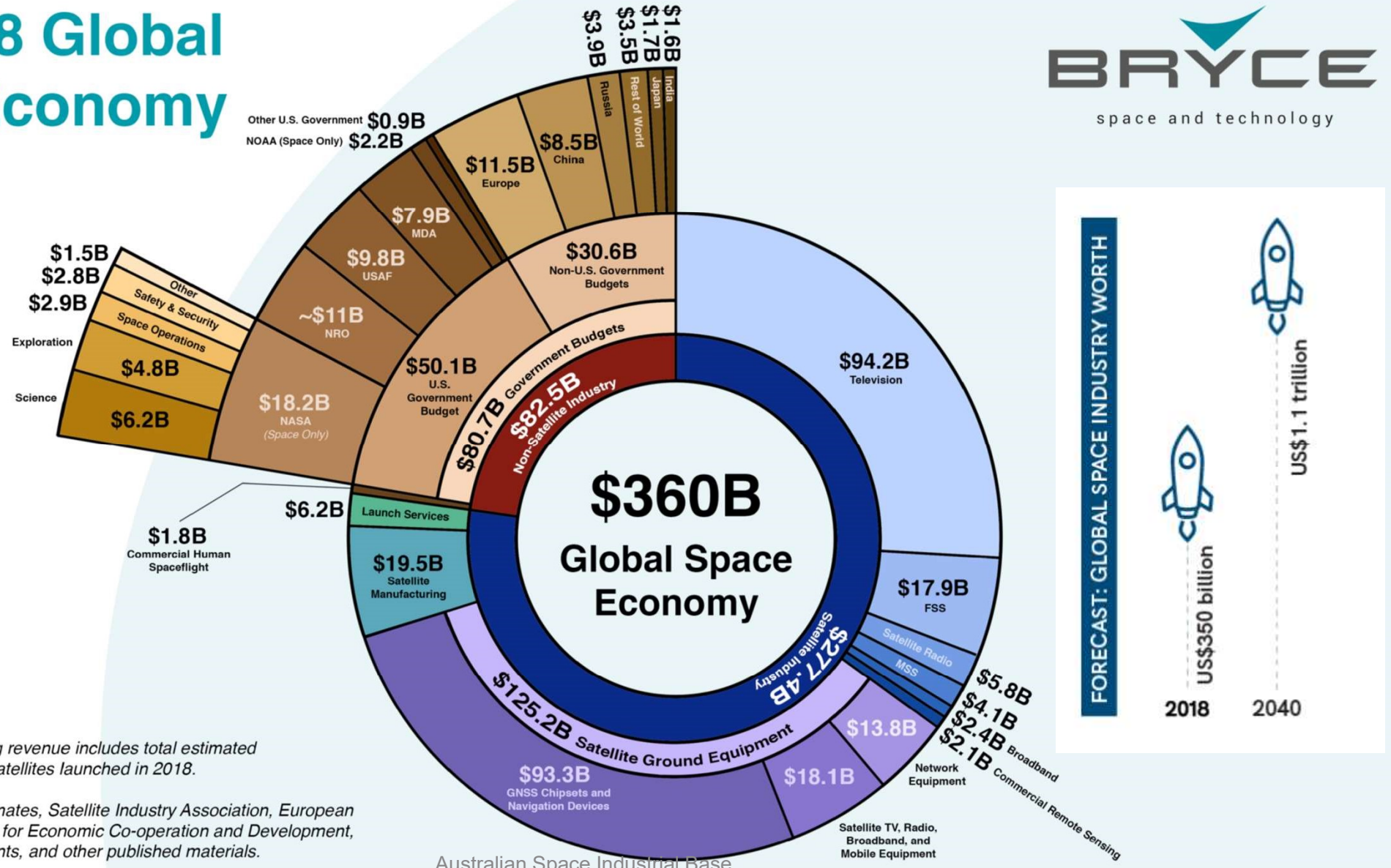
28 dedicated smallsat launches, almost half by China

57% of smallsats launched by U.S. launch providers

- Smallsats by the Numbers 2020, Bryce Space & Technology, https://brycetech.com/reports/report-documents/Bryce_Smallsats_2020.pdf



The 2018 Global Space Economy

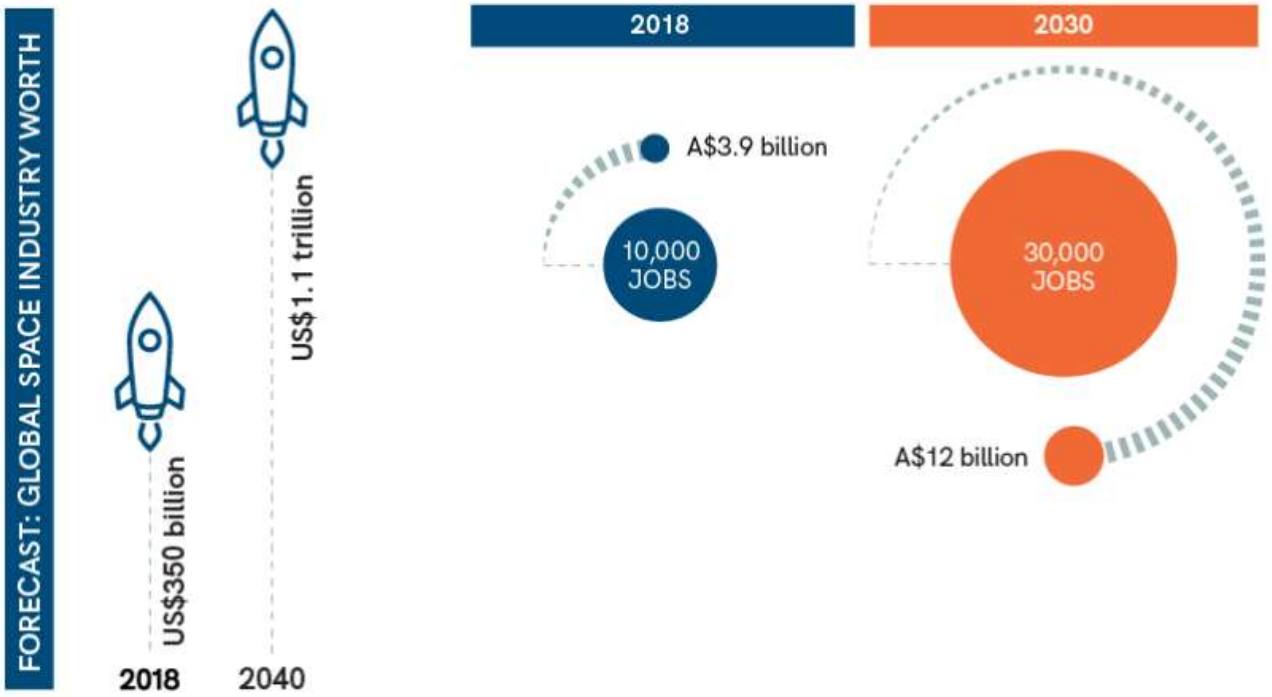


BRYCE
space and technology

Note: Satellite manufacturing revenue includes total estimated manufacturing revenue for satellites launched in 2018.

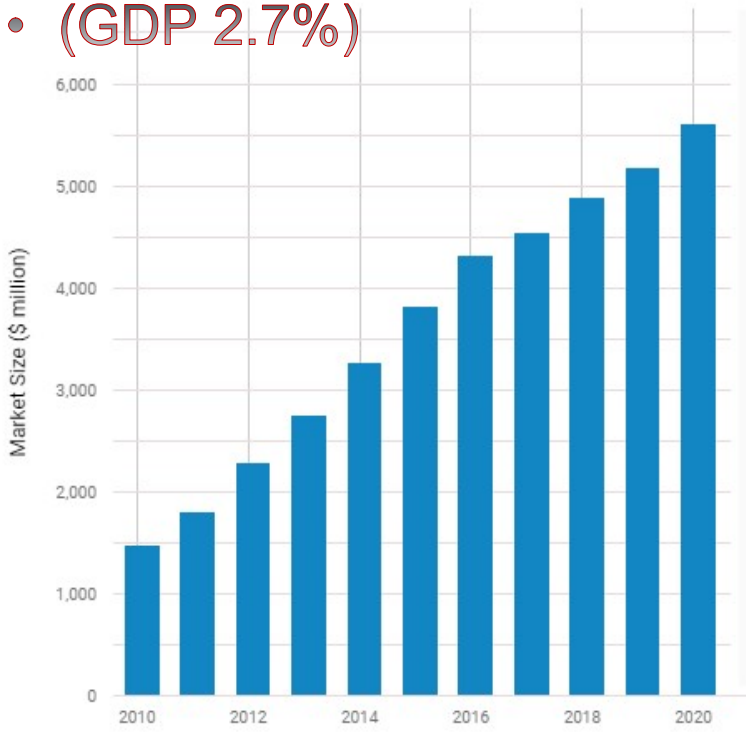
Sources: Bryce internal estimates, Satellite Industry Association, European GNSS Agency, Organisation for Economic Co-operation and Development, government budget documents, and other published materials.

National space economy - future



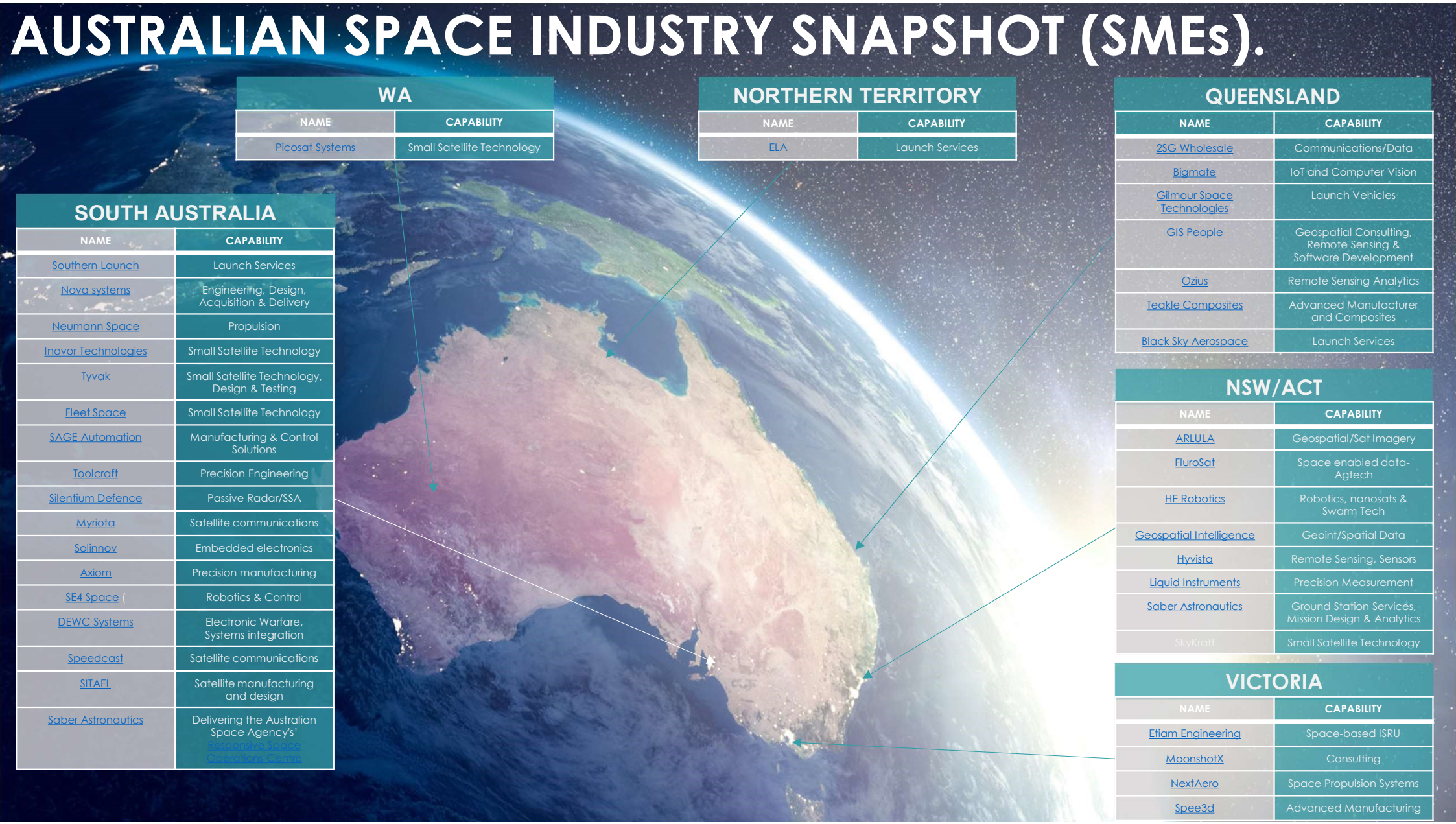
Advancing Space | Australian Civil Space Strategy 2019 – 2028 - p3

- AUD$ 5.6bn in 2020
- Growth 8.0% over last 5 years
- (GDP 2.7%)



IBIS - Satellite Communications and Astronautics in Australia Market Size 2007–2026

AUSTRALIAN SPACE INDUSTRY SNAPSHOT (SMEs).



WA

NAME	CAPABILITY
Picosat Systems	Small Satellite Technology

NORTHERN TERRITORY

NAME	CAPABILITY
ELA	Launch Services

QUEENSLAND

NAME	CAPABILITY
2SG Wholesale	Communications/Data
Bigmate	IoT and Computer Vision
Gilmour Space Technologies	Launch Vehicles
GIS People	Geospatial Consulting, Remote Sensing & Software Development
Ozius	Remote Sensing Analytics
Teakle Composites	Advanced Manufacturer and Composites
Black Sky Aerospace	Launch Services

SOUTH AUSTRALIA

NAME	CAPABILITY
Southern Launch	Launch Services
Nova systems	Engineering, Design, Acquisition & Delivery
Neumann Space	Propulsion
Inovor Technologies	Small Satellite Technology
Tyvak	Small Satellite Technology, Design & Testing
Fleet Space	Small Satellite Technology
SAGE Automation	Manufacturing & Control Solutions
Toolcraft	Precision Engineering
Silentium Defence	Passive Radar/SSA
Myriota	Satellite communications
Solinnov	Embedded electronics
Axiom	Precision manufacturing
SE4 Space (	Robotics & Control
DEWC Systems	Electronic Warfare, Systems integration
Speedcast	Satellite communications
SITAEL	Satellite manufacturing and design
Saber Astronautics	Delivering the Australian Space Agency's' Responsive Space Operations Centre

NSW/ACT

NAME	CAPABILITY
ARLULA	Geospatial/Sat Imagery
FluroSat	Space enabled data-Agtech
HE Robotics	Robotics, nanosats & Swarm Tech
Geospatial Intelligence	Geoint/Spatial Data
Hyvista	Remote Sensing, Sensors
Liquid Instruments	Precision Measurement
Saber Astronautics	Ground Station Services, Mission Design & Analytics
SkyKraft	Small Satellite Technology

VICTORIA

NAME	CAPABILITY
Etiam Engineering	Space-based ISRU
MoonshotX	Consulting
NextAero	Space Propulsion Systems
Spee3d	Advanced Manufacturing

Australian New Space

COMPANY NAME	REMIT	TOTAL FUNDING & ROUND	STATE	NOTABLE INVESTORS
Fleet Space	Small Sats	SERIES A AU$11.5M SEED ROUND AU$6M	SA	Momenta Ventures, Horizons Ventures, Horizon Partners & Blackbird Ventures
Myriota	IoT Connectivity	SERIES A AU$15M SERIES B AU$28M	SA	Boeing HorizonX Ventures, Main Sequence Ventures, SA Venture Capital Fund & Singtel Innov8
Neumann Space	Space-propulsion	SEED ROUND AU$822K	SA	Earth Space Robotics, SA Venture Capital Fund
Gilmour Space	Launch Vehicles	SERIES A AU$5M SERIES B AU$19M	QLD	Main Sequence Ventures, Blackbird Ventures & 500 Startups
Flurosat	Analytics, Machine Learning	SEED ROUNDS- AU$6.5M	NSW	M12, Airtree Ventures & Main Sequence Ventures

Figures may be higher in some instances due to publicly undisclosed private VC funding

KEY INVESTORS IN AUSTRALIAN NEWSPACE.

BOEING HORIZONX

Singtel innov8

M12

MOMENTA VENTURES

Culture

THE AUSTRALIAN

Overhaul needed if Defence to deliver, says Linda Reynolds

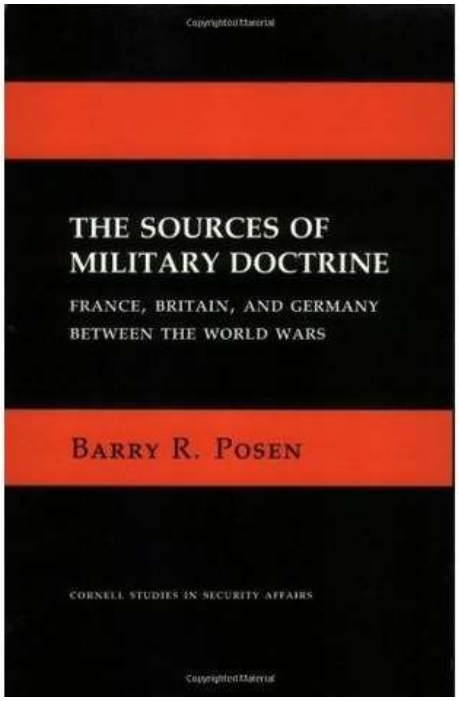
By BEN PACKHAM, FOREIGN AFFAIRS AND DEFENCE CORRESPONDENT
9:50PM AUGUST 7, 2020 • 172 COMMENTS

- Defence Minister Linda Reynolds has warned her department needs a major overhaul to be able to deliver the government's $270bn upgrade to the nation's military capabilities.
- Senator Reynolds said delivery of new capabilities had been a "perennial problem" for Defence over the past century, and she had embarked on a reform program to give it "the backbone" to respond to the government's requirements.
- "We have got the right capability plan, but **we don't have an organisation that is yet adaptable enough to actually deliver**," she told the Australian Strategic Policy Institute.
- "We have got a very large defence organisation, which is better than it used to be under our force structure plan process.
- "But there is a lot of work to be done to continually transform the organisation to keep up with technological change and disruption, but also to make sure we can keep delivering what we need to."
- Part of the task would involve sharpening the way Defence worked with 15,000 private sector companies in its supply chain.
- **"We have come to this realisation — Defence has, some belatedly I would argue — that Australian industry is far more capable then we had previously given it credit for,"** she said.

https://www.theaustralian.com.au/nation/defence/defence-in-need-of-some-backbone-says-minister-linda-reynolds/news-story/7a910dd67d1b4ba7bc4c36e8c0df8a12

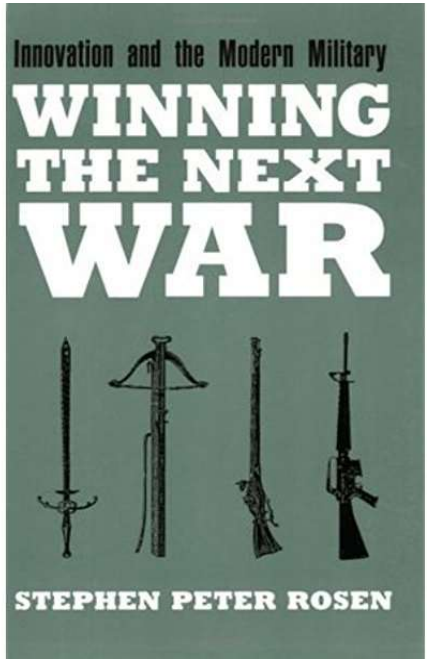
Culture Change

"Victory smiles upon those who anticipate the changes in the character of war, not upon those who wait to adapt themselves after the changes occur"
Giulio Douhet, "The Command of the Air", 1921



Posen - civilian leaders use military mavericks as agents to cause major changes

Rosens interservice rivalry perspective



Kotter

What could an Australian SIB do?

- **shape Australia's strategic environment;**
- **deter actions against Australia's interests; and**
- **respond with credible military force, when required**

Shape

- See & observe from space
- Using AI and Machine Learning

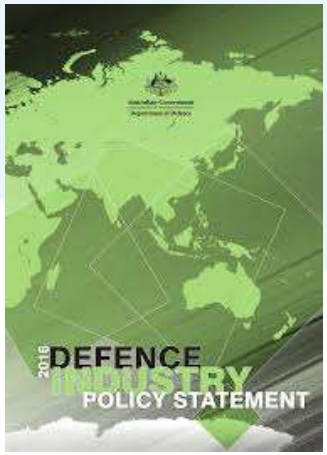
Deter

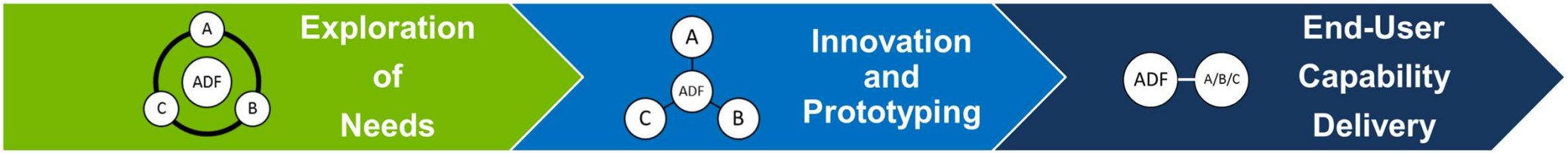
- Space Domain Awareness
- Operationally responsive space
  - Launch
  - Many, small, meshed

Respond

- Reversible effects
  - EM Jamming
  - Laser dazzling

What does an Australian IB look like?





What is the Australian SIB - TODAY ?

Shape

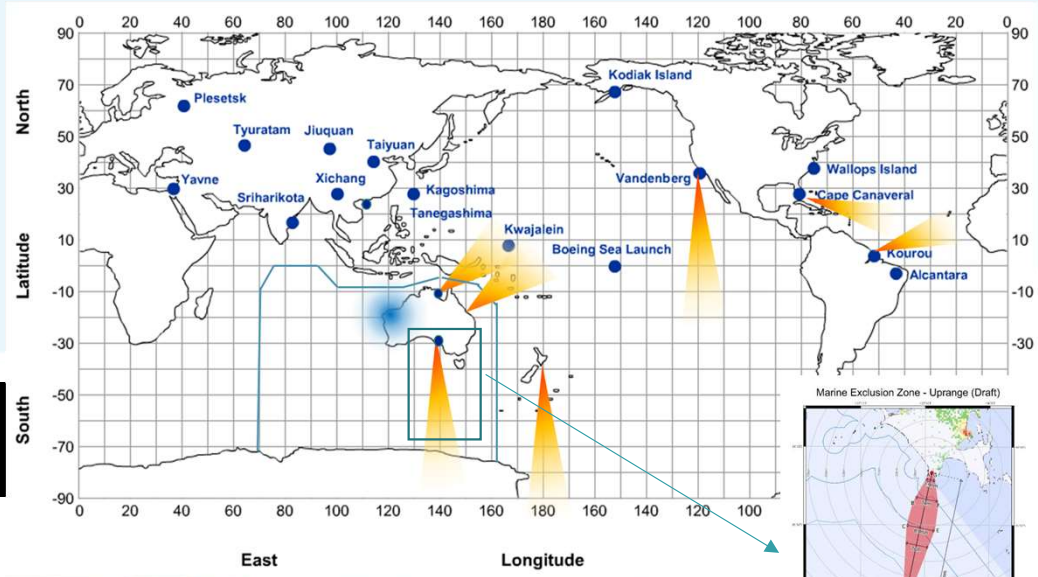
- See & observe from space
- Using AI and Machine Learning

Australian Space Industrial Base

What is the Australian SIB - TODAY ?

Deter

- Space Domain Awareness
- Operationally responsive space
  - Launch
  - Many, small, meshed




Inovor Technologies partnered with Sitael


Myriota partnered with Tyvak


Fleet Space Technologies

Southern Launch

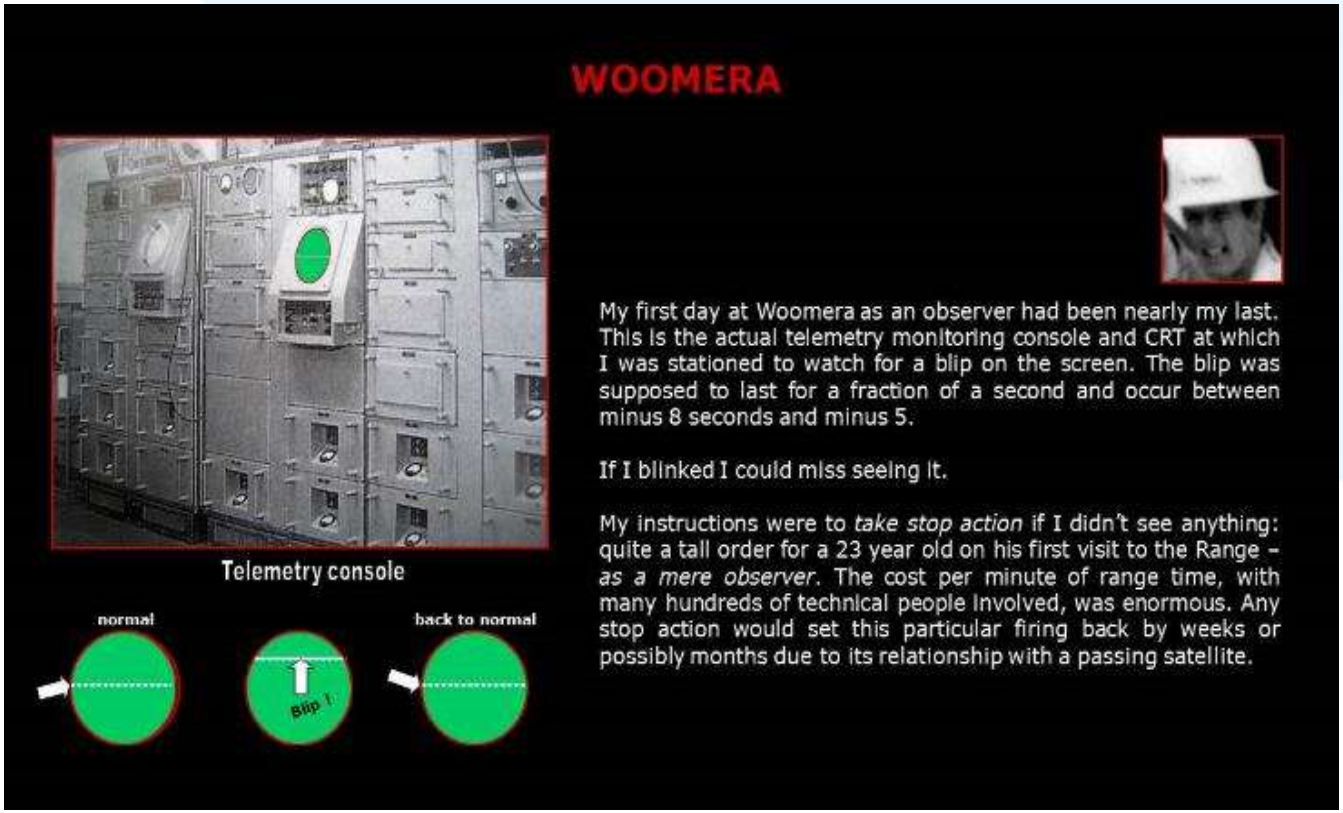
What is the Australian SIB - TODAY ?

Respond

- Reversible effects
  - EM Jamming
  - Laser dazzling

Technically feasible at low cost and high TRL

Australian space 1964 re-launched?



Conclusion

1. A sense of urgency
2. Partner with Australian Industry
3. Energise discussion on Space Industrial Base Policy
   - Resilience
   - Sovereign capability
4. Be bold, take risk - the alternative is worse
5. Invest to progress – leave a legacy

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E: darin.lovett@defence.gov.au
E: darin.lovett@sa.gov.au

Paradigm Shift

The transition from a paradigm in crisis to a new one from which a new tradition of normal science can emerge is far from a cumulative process, one achieved by an articulation or extension of the old paradigm.

Rather it is a reconstruction of the field from new fundamentals, a reconstruction that changes some of the field's most elementary theoretical generalizations as well as many of its paradigm methods and applications. During the transition period there will be a large but never complete overlap between the problems that can be solved by the old and by the new paradigm. But there will also be a decisive difference in the modes of solution. When the transition is complete, the profession will have changed its view of the field, its methods, and its goals.

Thomas Kuhn – The Structure of Scientific Revolutions (1962)

AUSTRALIAN STATE & FEDERAL GOVERNMENT VCs.

- Both Australian States and the Federal Government recognise the necessity to invest in Australian future industry orientated companies. Mechanisms and bodies with investment portfolios include:
  - **CSIRO's Main Sequence Ventures:** The Commonwealth Scientific and Industrial Research Organisation (CSIRO) is an Australian Federal Government agency responsible for scientific research. Main Sequence Ventures is a manager of the CSIRO'S AU$200 million Innovation Fund, which is intended to help improve the translation of Australian publicly-funded research into commercial outcomes and stimulate innovation in Australia.
  - **South Australian Venture Capital Fund:** The South Australian Governments AU$50 million South Australian Venture Capital Fund (SAVCF) is available to help build dynamic and innovative early-stage companies to accelerate their growth to a national and global scale. The SAVCF has been structured as a co-investment fund, requiring each initial investment into an eligible company to be matched with at least 50% investment from other venture capital funds, high net-worth's or other sophisticated investors.
  - **Queensland Business Development Fund:** The Queensland Governments Business Development Fund (BDF) provides funding of between AU$125,000 and AU$2.5 million to Queensland based businesses, particularly in the emerging future industries. Funding is provided on a co-investment basis similar to that of the **SAVCF.**
  - **Northern Territory Paspalis Innovation Investment Fund:** This territory fund seeks to invest in Australian companies seeking growth in the Asia Pacific region and Asia Pacific companies seeking to relocate to Australia. Investments range between AU$50,000 to AU$2.5 million per investment.

AUSTRALIAN DEFENCE: AN INVESTOR IN FUTURE INDUSTRIES. A1

- **Defence Science & Technology (DST):** DST is the Australian Government's lead agency responsible for applying science and technology to safeguard Australia's interests. It runs multiple programs utilised as mechanisms for growing industries with applications in defence. These include:
- **Next Generation Technologies Fund:** With an investment of AU$730 million until 2026, this fund focuses on research and development in emerging and future technologies. Priority areas include: Space Capabilities, ISR, Multi-disciplinary material sciences, Cyber, Autonomous systems and Advanced Sensors.
- **Defence Innovation Hub (DIH):** Funded at AU$640 million to 2025-26, the DIH provides opportunities for academia, research organisations and Australian businesses of all sizes to put forward innovative proposals that can enhance Defence capabilities. It accepts proposals that are ready to enter different stages of the innovation process; including:
  - Concept exploration
  - Technology development
  - Prototyping; and
  - Demonstration and evaluation.
- **Centre for Defence Industry Capability (CDIC):** CDIC supports Australian businesses entering or working in the defence industry. Amongst its suite of services, it links Australian companies, innovators and researchers to the **Defence Innovation Hub** and **the Next Generation Technologies fund.** It further undertakes its own sector-wide projects to support industry development.

Slide 33

A1 is there a value for the DIH? i remeber it is similar to the next gen budget?
Author, 23/04/2020

OTHER AUSTRALIAN FEDERAL GOVERNMENT SUPPORT MECHANISMS.

- Department of Industry, Science, Energy and Resources- Cooperative Research Centres CRC Program:
  - The Cooperative Research Centres CRC Program supports industry-led collaborations between industry, researchers and the community. The CRC program has two elements:
    - Cooperative Research Centres Grants (CRCs) to support short term, industry led collaborative research; and
    - Cooperative Research Centres Projects (CRC-Ps), to support short term industry led collaborative research
  - Since inception in 1990, the CRC program has committed AU$4.9 billion in funding to support the establishment of 225 CRC Grants and 135 CRC-P Grants- a total of 360 collaborations funded over the program.
- Venture Capital Limited Partnerships (VCLP) Program:
  - The VCLP offers tax benefits to fund managers and eligible foreign investors to help stimulate venture capital investment. The program:
    - Helps fund managers attract pooled capital, so as to raise VC funds over AU$10 million
    - Offer tax benefits to fund managers and eligible foreign investors
    - Connects investors with innovative Australian businesses; and
    - Helps Australian businesses grow by receiving financial support.