International Models – Defence Research and Spending

National Defence Research Roundtable

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Scoping "Defence" Research

Defence

National Security

"Total Defence"

How Defence Research is Done

Defence Universities
Mission-driven institutions (university and college level) designed to train military officers, which may offer civilian programming. May be engaged in basic research and/or advanced research; research programs responsive to military strategic priorities.

Military Research Institutes
Research institutes that are controlled directly by military and sole-source funded by military and/or equivalency of ministry of defence. Research organized around strategic military priorities and development of technical advice. Prevalent in France and Finland.

Research Centers / UARC model
Long-term dedicated research centers within civilian universities, funded by defence agencies/government in areas of long-term strategic interest or that require long-term investment in facilities and R&D to yield results. Most notable example is the US UARC model. Enables long-term advanced research.

Multi-Institutional Networks
Networks made up of multiple civilian institutions to facilitate and/or conduct defence research. This ranges from specific collaborative projects (UK), research facilitation and promotion networks (ADSUN), to research coordination networks (Campus Total Defence). Enables sharing and leveraging of expertise and resources, coordination of institutional specialization, increased ability to demonstrate ROI on industry investments.

Competitive Bid Single Projects
Cyclical competitive funding programs without guarantee of renewal or prospect of long-term investment. Major source of defence research funding in the US through Broad Agency Announcements (BAA) system. Research limited by cyclical and precarious nature of funding; good for component and prototype development.

Industry Collaborations
Research conducted in partnership with industry. May involve co-creation with external partners, industry-sponsored facilities and equipment, or industry sponsoring additional stages of research for promising ongoing projects. This may originate with an industry partner approaching a researcher or university, or with researchers pitching to industry.

France

→ Highly centralized system made up of government-affiliated institutions and direct partnerships between universities and Ministry of Armed Forces

→ Significant focus of research and development efforts oriented around government priorities of consolidating technological superiority of the military, increasing the "influence" of French military

→ Research ecosystem oriented through

  → *Académie de la défense de l'école militaire:* focused on promoting French research and work of its members (influence mission)

  → *Institut de Recherche Stratégique de l'école militaire:* mission-driven applied research and curiosity-driven research

Institut Polytechnique de Paris

➢ Not a military college, but holds military status

  ➢ Engineering students serve as cadets, obtain military appointments upon graduation

➢ Champion of dual-use research that other European institution shave traditionally shied from

➢ Home to multiple government established and funded research centers – significant part of realizing government defence strategies

  ➢ *Interdisciplinary Centre for Defence and Security*: focused on connecting academics and industry; emphasis on facilitating technology transfer

  ➢ *Research Centre of the Ministerial Agency for Artificial Intelligence in Defence*: created to support government defence strategies through fostering development of defence AI and promoting French research in the field

United States

→ DoD is largest funder of defence research

→ Funding flows through many channels

   → To projects, researchers, and labs

   → To universities through the partial or full funding of labs and research infrastructure

→ In 2024, DoD allocated $148.5 billion USD to research

   → Basic research receives a very small portion (1.8%)– 60% of this goes directly to universities for labs and infrastructure

   → Advanced technology development and prototypes (26.4%) and operational systems development (34.5%) receive the majority of funds

→ Large infrastructure of DoD programs to promote and develop researcher pipeline, research infrastructure

Broad Agency Announcements (BAA)

Equivalent of calls for proposals; allows for submission of proposals or white papers

Three types:

➢ Informational: long-shot for funding, primarily serve to inform DoD program managers of potentially interesting work

➢ Annual: cyclical funding

➢ Topical: responsive to emerging needs, may be disciplinary or problem-specific

University Affiliated Research Labs (UARC)
15 UARCs across the US, all sponsored by branches of US Military
Specialized research in areas of long-standing strategic priority

Basic Research Labs
Government funded basic research labs at 18 universities across the US (Sponsored by Dept of Defence, Dept of Energy)
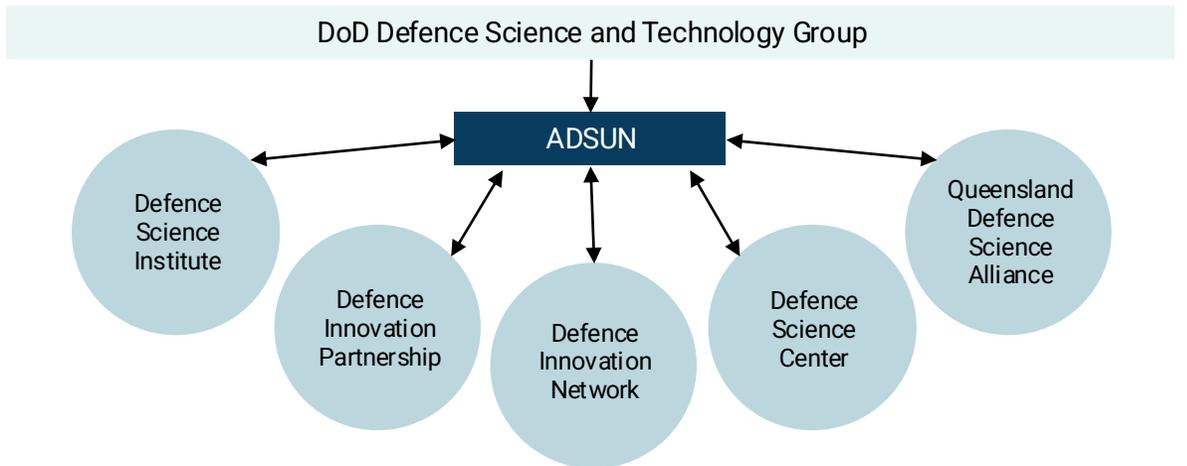
United Kingdom

⇢ Mixed defence research ecosystem driven by government and industry investment

⇢ MoD procurement frameworks increasingly enable government to direct more spending into university-based defence research

⇢ MoD becoming major funder of advanced research – significant portion via Royal Navy commissioned research and university partnerships
- Priority investment areas: Navy, submarines, nuclear

⇢ Government mobilizes research ecosystem through:
- Strategic partnerships with individual universities
- Problem-specific multi-institutional research networks that can be mobilized as MoD talent pool

⇢ Industry partnerships in university research oriented largely around supporting development of products for market, less emphasis on basic research

⇢ Industry partnerships increasingly oriented away from research and towards upskilling education, meeting workforce needs for defence production
- ⇢ This kind of investment can have knock-on benefits on research ecosystem

Australia

→ Began turn towards prioritization of national defence in 2019; further catalyzed by invasion of Ukraine

→ Has rapidly developed a network approach to defence research and development that combines elements of existing systems in allied nations, particularly the American University-Affiliated Research Center Model

→ Defence research ecosystem coordinated through hub and spoke model

→ Introduced Defence Trailblazer funding scheme to supercharge research ecosystem

→ Some defence research priorities are top-down, but many are driven by industry partnership and commercialization of applied research

  → System characterized by entrepreneurialism, desire to create self-sustaining research ecosystem

Hub and Spoke Model: Australian Defence Science and Universities Network

DoD Defence Science and Technology Group

ADSUN

Defence Science Institute

Defence Innovation Partnership

Defence Innovation Network

Defence Science Center

Queensland Defence Science Alliance

Initiative Spotlight: UNSW Defence Research Institute

→ Supports defence and dual-use researchers across UNSW's 7 faculties; "uplifts" defence acumen and supports the identification of defence and dual use grants domestically and abroad

→ Increasingly focus on long-term strategic industry partnerships to reduce reliance on granting cycles

  • Supporting product development of companies that sell to their allies

→ Focus on entrepreneurialism and financially self-sufficient research ecosystem

Sweden

→ Priority setting has historically been top-down, with the Swedish Defence University as the primary hub for research

→ Research at SDU primarily commissioned by multiple levels of government, agencies of government
  • Includes outsourcing of reviews, assessments of government responses and readiness

→ Swedish Defence Research Agency (FOI) conducts and coordinates client-driven and mission-driven research (client being government or military)
  • Projects largely funded by Armed Forces, Government
  • Some funded by civil authorities

→ Reorientation of defence priorities and research ecosystem in 2022 in response to invasion of Ukraine and application for NATO membership

→ "Total Defence" model and new bottom-up research approaches – with cooperative coordination

Initiative Spotlight: Campus Total Defence

→ Initiative originating at Swedish Defence University (SDU) in partnership with select group of civilian institutions

→ Now a network of 30+ Swedish universities oriented around upskilling Swedish population for "total defence"

→ Two-pronged approach
  • Development of specialized research hubs reflecting each university member's priority and strength areas
  • Upskilling mandate: providing education and training for total defence personnel for as many competencies as possible

"Total Defence" refers "to all essential social activities to be conducted in the event of heightened preparedness and war…consists of two parts: military and civil. Civil defence includes individuals, authorities, companies, and organisations. Together, these actors ensure that society can continue to function even in heightened preparedness and war by protecting the civilian population, ensuring essential societal functions, maintaining necessary supplies, and contributing to the military defence's capabilities in the event of armed attack or war in our surroundings."

Setting Defence Research Priorities

Top-Down / Government Set

- Challenges/funding pots
- One-time initiatives to supercharge a research area
- Topical calls for proposals / BAAs
- AURCs and Basic Research Labs
- UK Navy Programs
- Upskilling targets

Bottom-Up

- Total Campus Defence has attempted to drive national priorities by coordinating universities faster than the government's ability to do so

Researchers to Industry

- Researchers bringing ongoing research to industry, demonstrating its ROI and driving direction of investment
- Focus on developing the defence acumen of research ecosystem to prioritize research commercialization and technology transfer

Industry to Researchers

- Projects originating with industry sponsor, brought to institutions
- Prototyping work
- Industry sponsored facilities and other long-term industry partnerships

Structure of Funding and Investment

DIY
Example: French model of concentrating defence research ecosystem in defence university and IP Paris. Highly centralized, top-down.

Research Centre / UARC Model
Example: US University Affiliated Research Center (UARC) model of DoD funded, long-term research centers around strategic priority areas hosted by individual universities. Similar models in UK, Australia.

Industry Partners
Example: Australian and UK models of co-developing research programs responsive to industry needs, sustained by strategic industry investment.

Hub and Spoke Networks
Example: Australian Defence Science and Universities Network (ADSUN). Government funding flows through central hub to state-level bodies that promote and advance research in regional areas of strength and expertise.

Government Grant Cycles
Example: Canadian granting council and DND sponsored programs like IDEaS program, DND Research Initiative (with SSHRC), DND/NSERC Discovery Grant Supplement

One-Time Catalyst Investments
Example: Australian Defence Trailblazer scheme. One-time, non-renewable strategic investment of government money into catalyzing rapid development of research ecosystem