



**CENTREPOLIS**  
***Accelerator***

at Lawrence Technological University

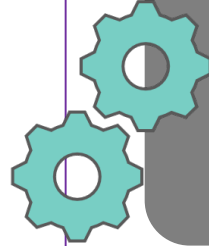
**US Army Ground Vehicle Systems Center**

**Sept 6, 2023**



# Defense Hardtech Accelerator Mission

MISSION



- 1) Fast Track defense and “dual purpose” technologies from TRL 5-9 that align with US Army GVSC R&D Roadmaps
- 2) Address critical system, component and material innovation leadership and domestic supply chain gaps

**industry 4.**  
Accelerator



DEFENSE HARDTECH  
ACCELERATOR



# Focus on Hardtech

Mission to get more products developed and manufactured domestically that address supply chain gap and are a defense and national security concern

## 1. Smart Hardware

Any physical product with a focus on mobility, electrification and systems that support the war fighter, included embedded software smart hardtech systems

## 2. Advanced Materials

Next generation alloys, lightweight materials, nano materials, composites, coatings, natural chemical free and biobased solutions, natural fiber, recycled upcycled and circular economy (sustainable) materials innovations

## 3. Advanced Manufacturing Technologies

Next generation machinery, tooling, manufacturing processes, robotics, automation, AI, and Industry 4.0 technologies



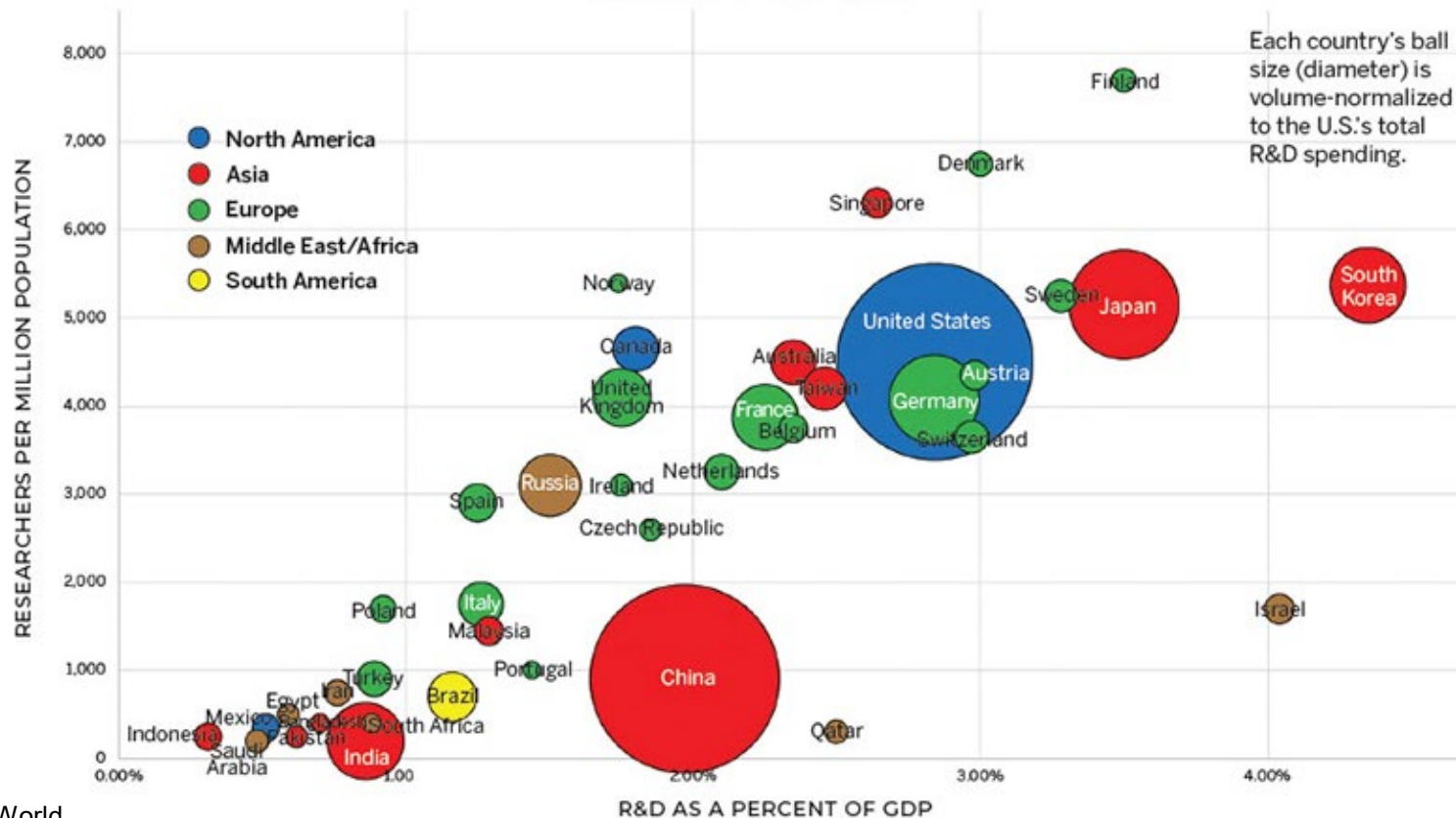
# The Problem

1. The number of small businesses doing work for the military as subcontractors and suppliers has shrunk by over 40% in the past decade. Small businesses make up 73% of the defense industrial base and last year were awarded over 25% of all Defense Department contracts, doing everything from manufacturing parts to building software platforms. Without action, the Defense Department could lose an additional 15,000 suppliers over the next decade, [the Pentagon said in a 2022 report.](#)
2. DOD funded / supported early stage technologies have limited success with commercialization
3. Limited programs that support defense technologies with commercial, technology and manufacturing readiness, technologies that provide US military a competitive advantage



# So what is the problem?

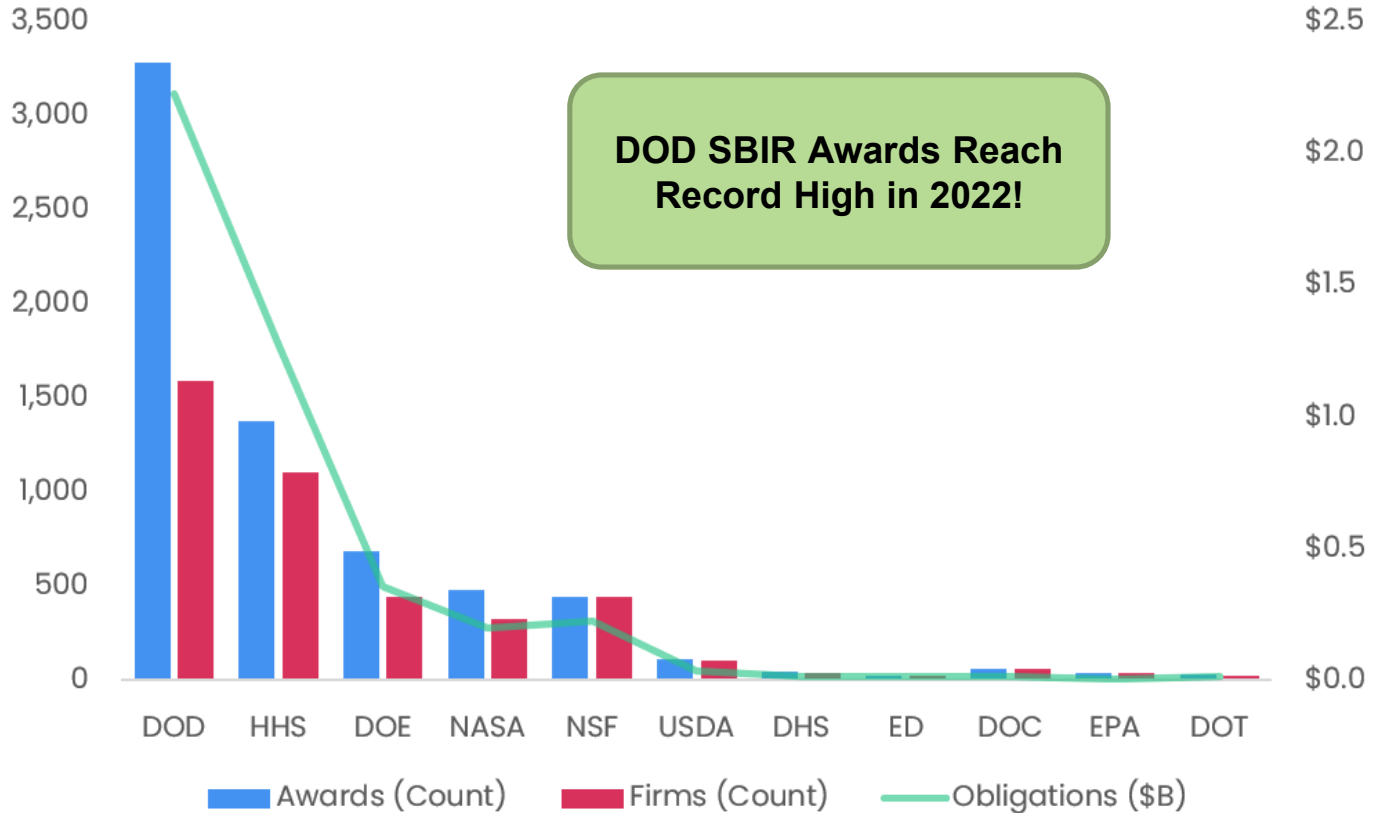
WORLD OF R&D 2020



Source: R&D World



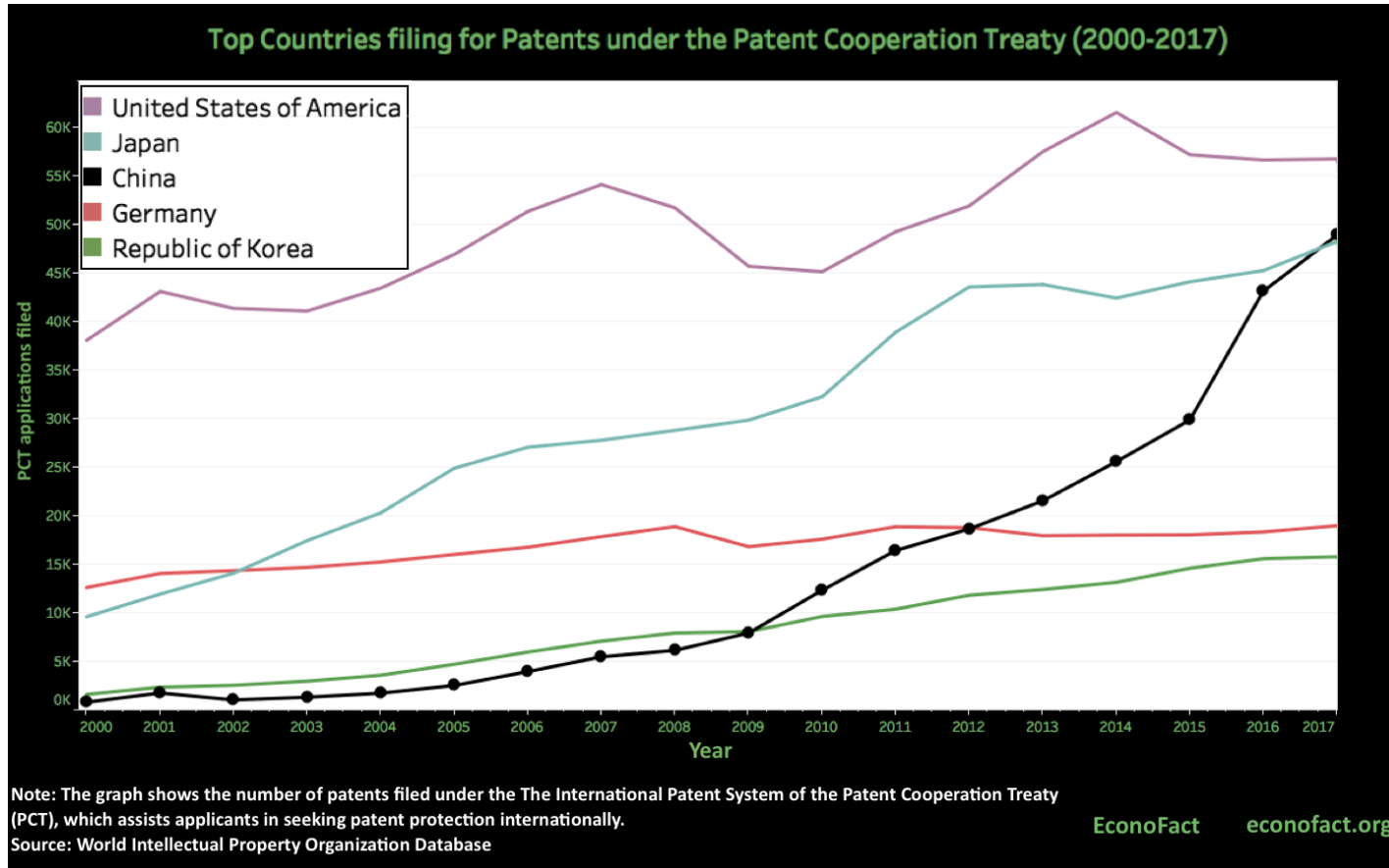
# So what is the problem?



Source: DoD – SBIR Awards 2022



# So what is the problem?

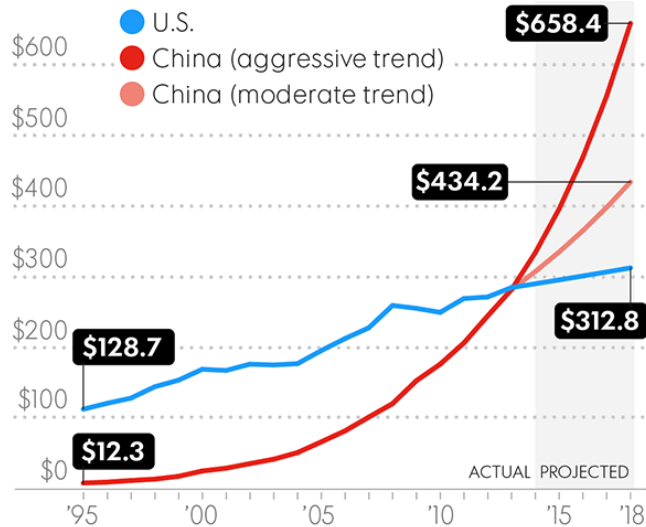




# The Problem

## CHINA OUTSPENDS THE U.S. IN LATE-STAGE RESEARCH & DEVELOPMENT

China is expected to spend up to twice as much as the U.S. on late-stage development research<sup>1</sup> by 2018. Actual and projected spending per year (billions):



1 — Research that leads to commercial products

**SOURCE** Boston Consulting Group analysis of National Science Board, Science and Engineering Indicators 2016, Organisation for Economic Co-Operation and Development data  
George Petras, USA TODAY



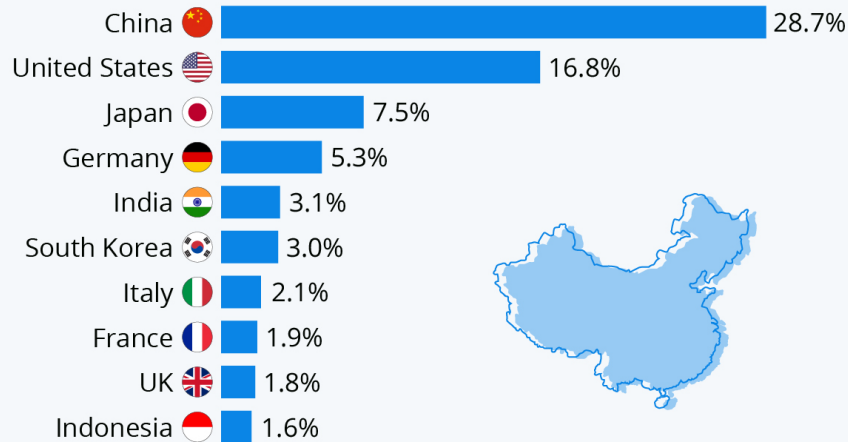




# The China Challenge

## China Is the World's Manufacturing Superpower

Top 10 countries by share of global manufacturing output in 2019\*



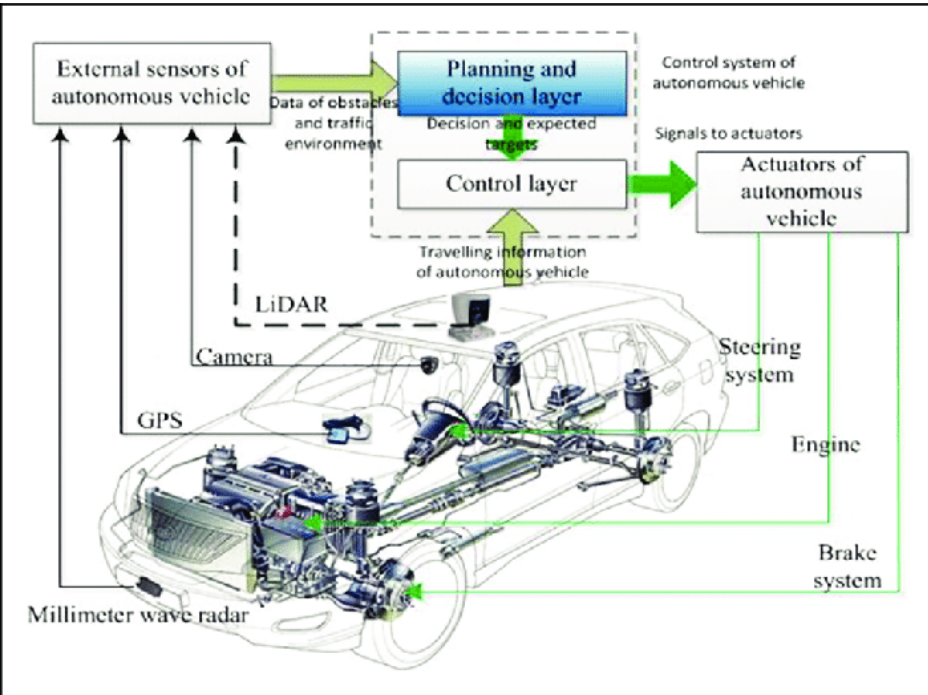
\* output measured on a value-added basis in current U.S. dollars

Source: United Nations Statistics Division

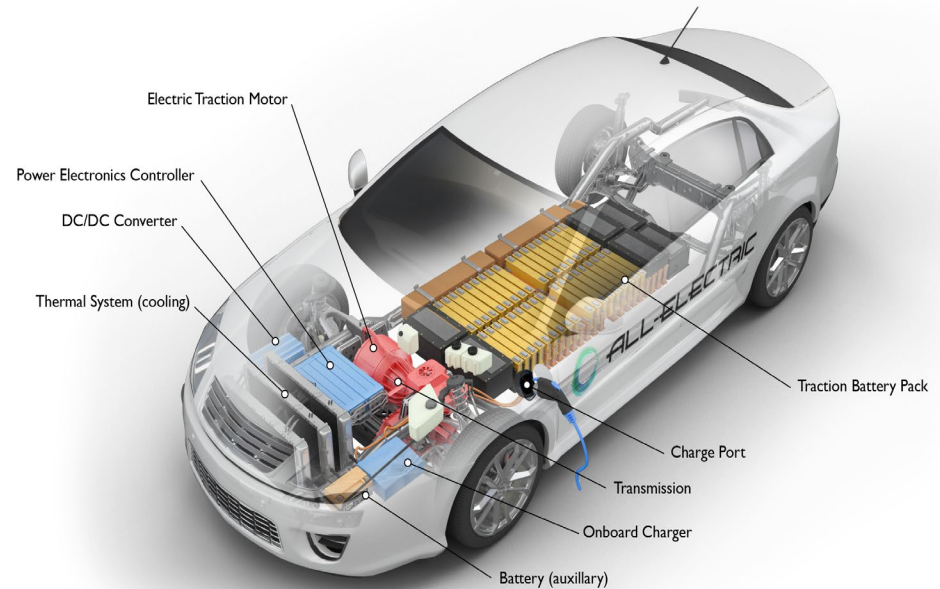




# An Autonomous and Electrified Future



## All-Electric Vehicle



afdc.energy.gov

Source: ResearchGate, DOE

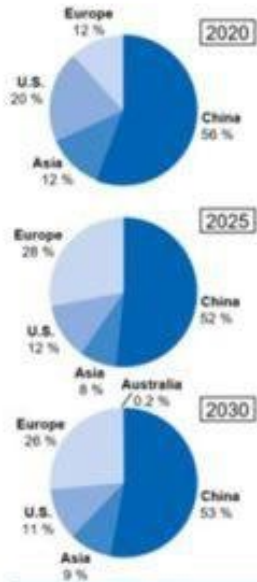


# Global Battery Manufacturing Capacity

BatteryBits

## Manufacturing Map: Global Installed Capacity

China dominates global market in existing and planned production capacity



Source: Bloomberg New Energy Finance, Benchmark Mineral Intelligence, CB Research, Reuters, Roland Zorn, press release, Jan 2021

VDE RENEWABLES

Capacity GWh	2020	2025	2030
CN	1247	704	1247
NA	65	165	266
EU	39	382	617
AS	41	110	219
Total	328	1360	2353

● Existing or planned gigafactory sites in 2030 are marked with a red dot.

\*Source: [VDE Renewables](https://www.vde-renewables.com)



# Energy Material Processing Controlled by China

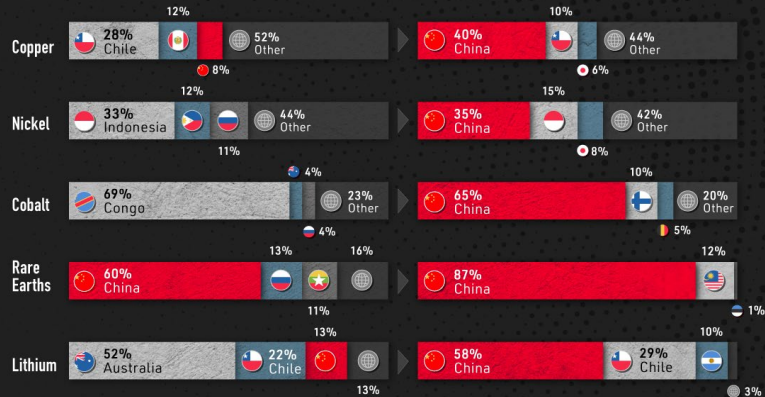
## VISUALIZING CHINA'S DOMINANCE IN CLEAN ENERGY METALS

Renewable sources of energy are expected to replace fossil fuels in the next decades, as the world's economies try to reduce carbon emissions and mitigate climate change.

This graphic based on data from the International Energy Agency illustrates where the extraction and processing of key metals for the green revolution take place, and how China is leading the process.

### Where Clean Energy Metals are Produced

### Where Clean Energy Metals are Processed



World demand for lithium is forecast to more than double between 2020 and 2023 as global electric vehicle uptake rises.

The Biden administration has targeted rare earths among domestic supply chain priorities.

Of the 255,000 Congolese mining for cobalt, 40,000 are children.

Source: International Energy Agency



The Earth's natural resources power our everyday lives. VC Elements breaks down the building blocks of the universe.

We live in a material world.



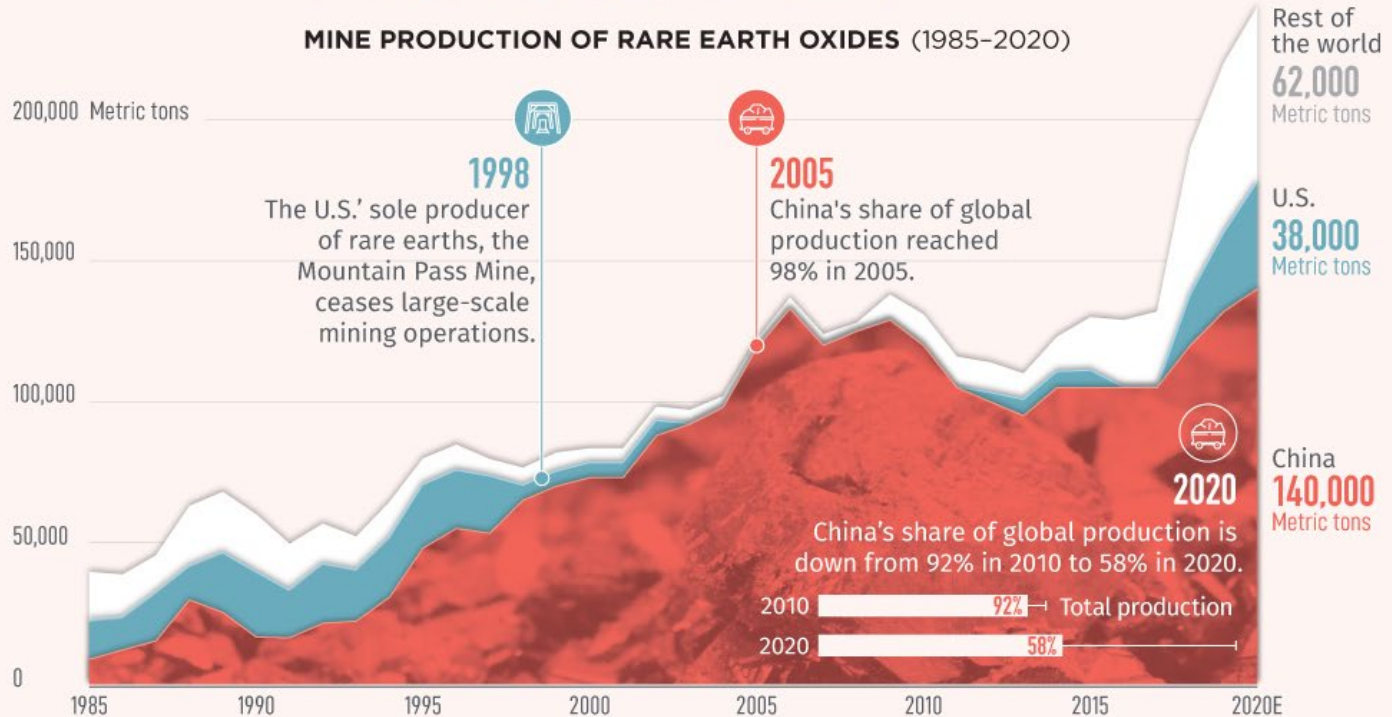
# Rare Earth Materials Controlled by China

ELEMENTS

## RARE EARTH METALS

PRODUCTION IS DIVERSIFYING AGAIN

MINE PRODUCTION OF RARE EARTH OXIDES (1985–2020)

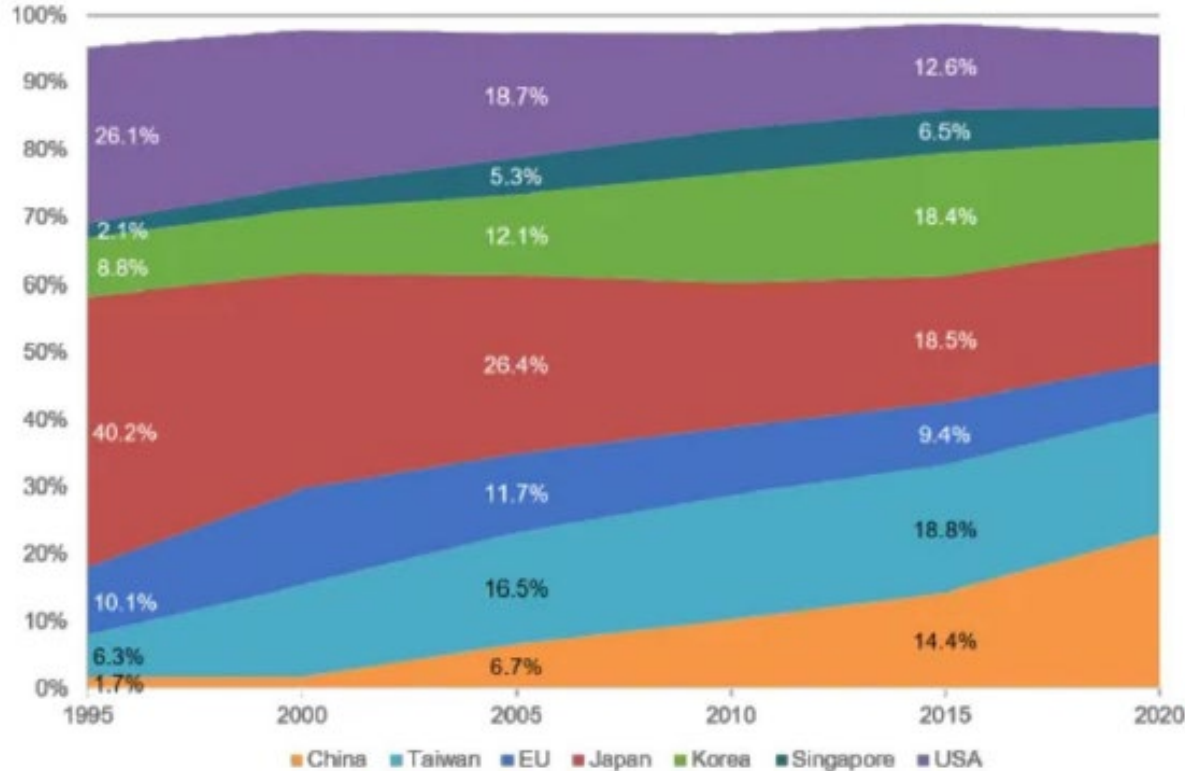




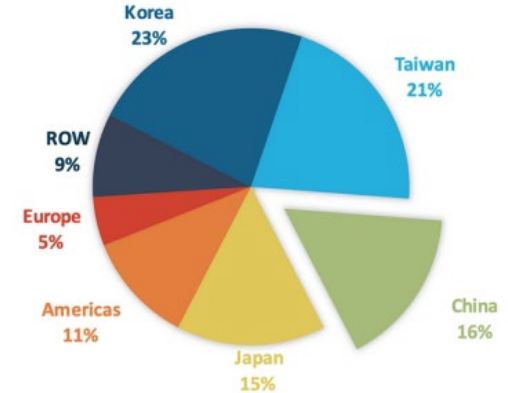


# Semiconductor Value Chain Globally

World Wafer Fab Capacity by Country / Region



Global IC Wafer Capacity at Dec-2021 – by Fab Location  
(21.6M 200mm-equiv. Wafers per Month)



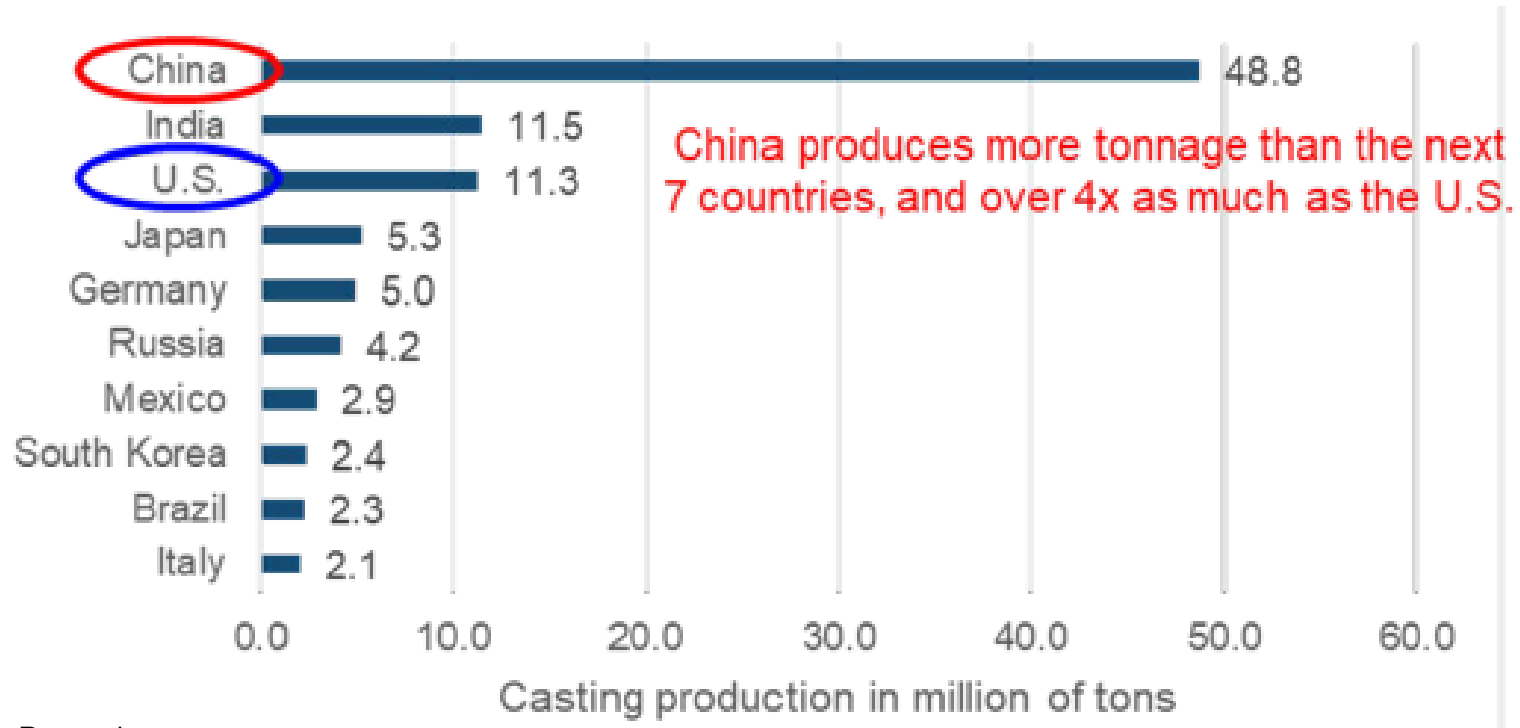
© Knometa Research, Global Wafer Capacity 2022

Source: Global SMT&Packaging, Design & Reuse



# Global Casting Production

Figure 4. Statista Research Department, Volume of the Global Casting Production in 2019, by Country, 23 March 2021.<sup>26</sup>





# Critical and Emerging Technologies List

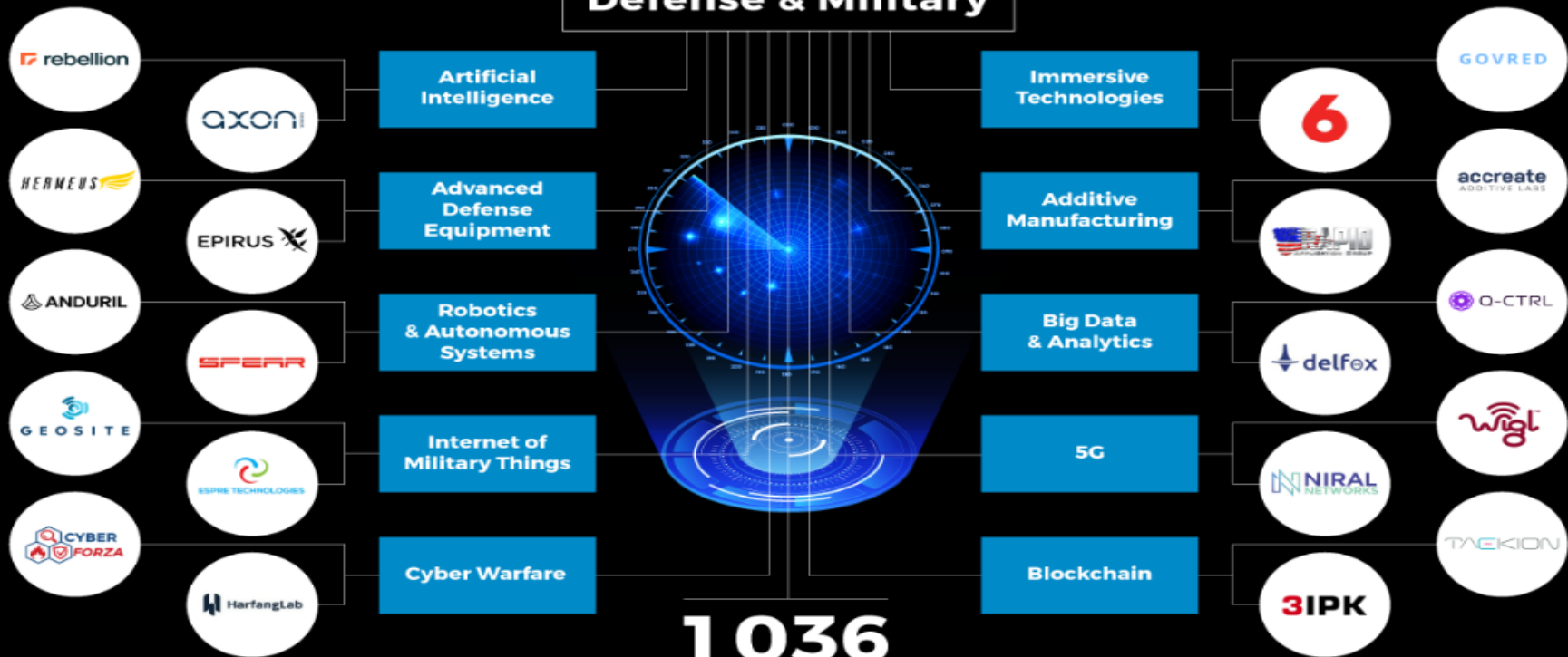
The following critical and emerging technology areas are of particular importance to the national security of the United States:

- 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



# Top 10 Military Technology Trends & Innovations in 2023

## Defense & Military



1036

Startups & emerging companies analyzed



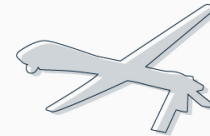
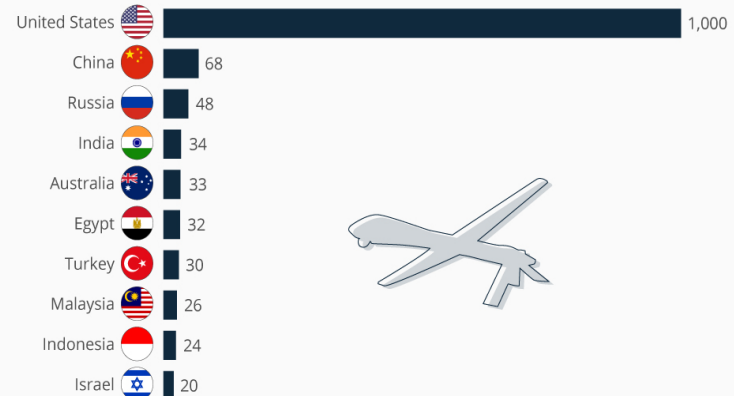
# New Replicator Program

- Driven by experiences of Ukraine-Russian conflict utilizing unmanned systems
- Designed to counter China's military mass
- Crank out "multiple thousands" of "attributable autonomous systems" across "multiple domains" within 2 yrs
- Networked UAS - Harder to plan for, harder to hit, harder to beat
- Deputy Secretary of Defense Kath Hicks will oversee the effort with the vice chairman of the Joint Chiefs of Staff, supported by the Defense Innovation Unit



### The Countries Set To Dominate Drone Warfare

Total forecast purchases of weaponized military drones up to 2028



















© StatistaCharts Source: Jane's Markets Forecast via The Guardian

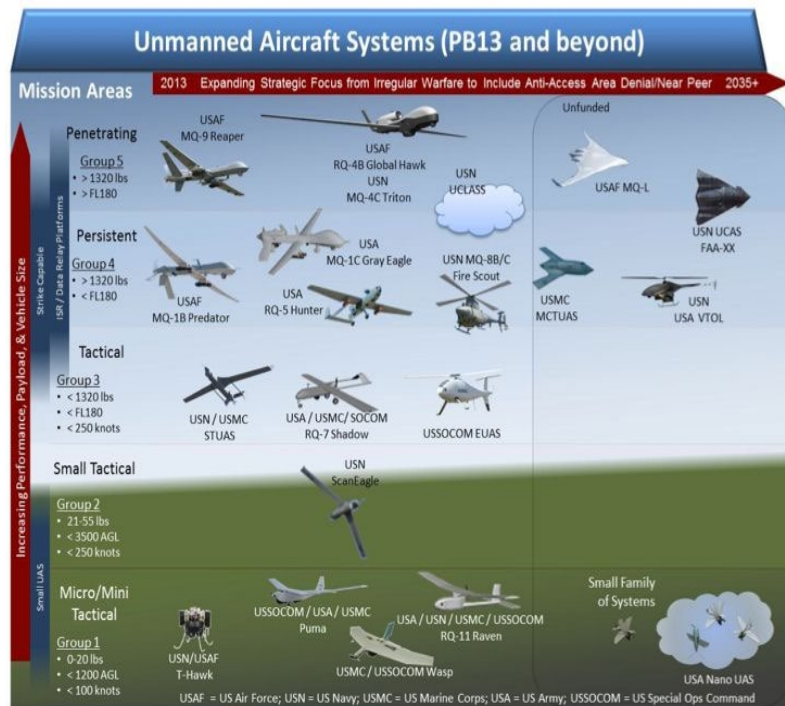




# Unmanned Autonomous System Applications

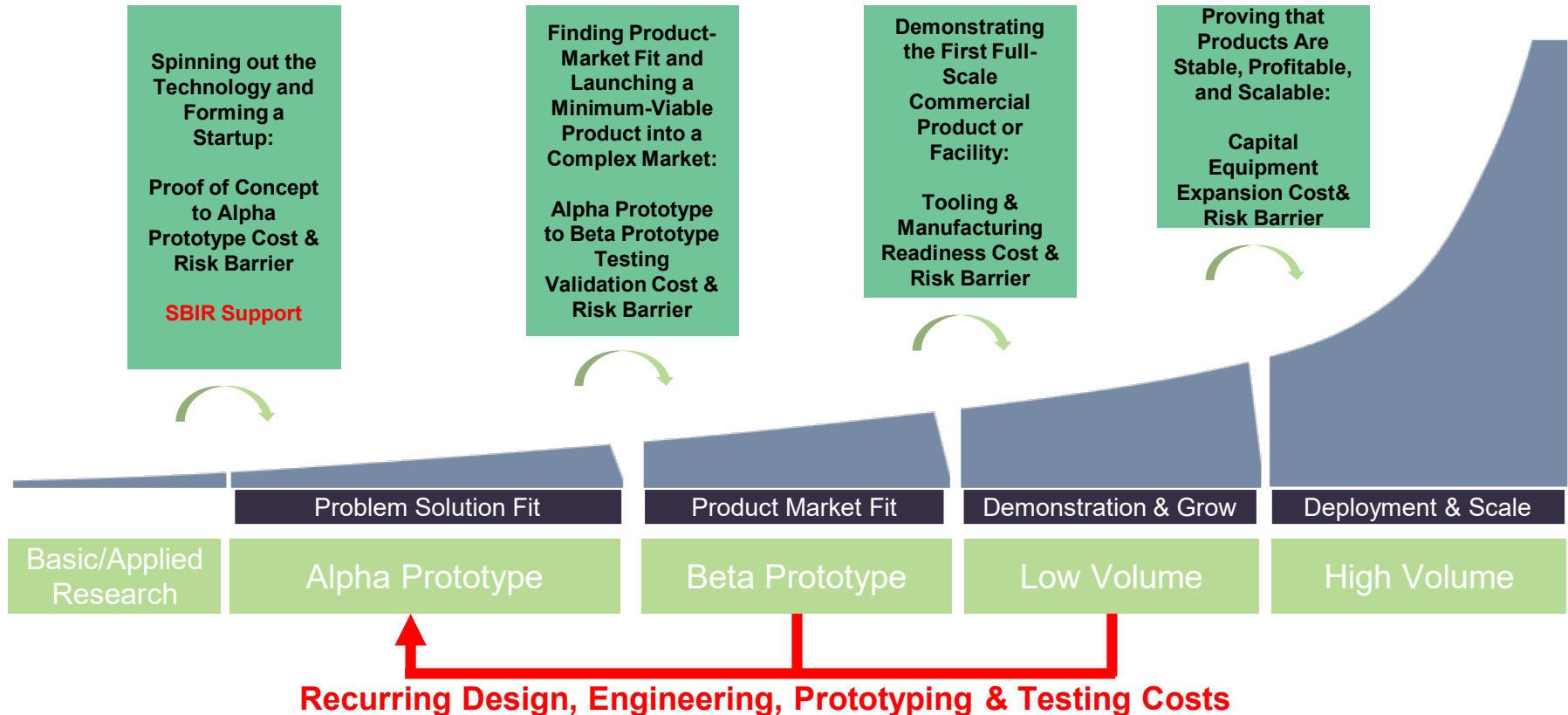
Soldier Transportable	Vehicle Transportable	Self Transportable	Applique
 <p><b>Crew Served Bot</b></p>	 <p><b>Mounted or Towed</b></p> <p>Man Transportable Robot Systems (MTRS) POR</p>	 <p><b>Soldier Follower - IBCT</b></p> <p>Squad Mission Equipment Transport (SMET) CDD</p>	 <p><b>Remote Operation</b></p> <p>Husky Mounted Detection (HMDS) POR</p>
 <p><b>Small Bot</b></p> <p>Small Unmanned Ground Vehicle (SUGV) CDD</p>	 <p><b>Medium Wingman - SBCT</b></p> <p>Multi-Mission Unmanned Ground Vehicle (MM-UGV) CDD</p>	 <p><b>Medium Wingman - SBCT</b></p> <p>Multi-Mission Unmanned Ground Vehicle (MM-UGV) CDD</p>	 <p><b>Supervised Autonomy</b></p> <p>Convoy Active Safety Technology (CAST) CDD</p>
 <p><b>Micro Bot</b></p>	 <p><b>Armed</b></p>	 <p><b>Heavy Wingman - HBCT</b></p>	 <p><b>Full Autonomy</b></p> <p>Combat Autonomous Mobility System (CAMS) JCTD</p>
 <p><b>Nano Bot</b></p>	 <p><b>Humanoid</b></p> <p>Battlefield Extraction Assist Robot (BEAR) Initiative</p>	 <p><b>Squad Member</b></p>	 <p><b>Exoskeleton</b></p> <p>Exoskeleton (XOS) CDD</p>

DoD Army UGV campaign plan. (Source: U.S. Department of Defense)



# Why do Hardtech companies fail?

## Stages of a HardTech Start-up – 4 Valleys of Death



# Hardtech Investment Gap

Market Failure in Pre-Competitive Applied Manufacturing R&D

Funding/  
Investment

High

Government and  
Universities

GAP

Private Sector

Low

Manufacturing-Innovation Process





## Limited Funding for Hardware!



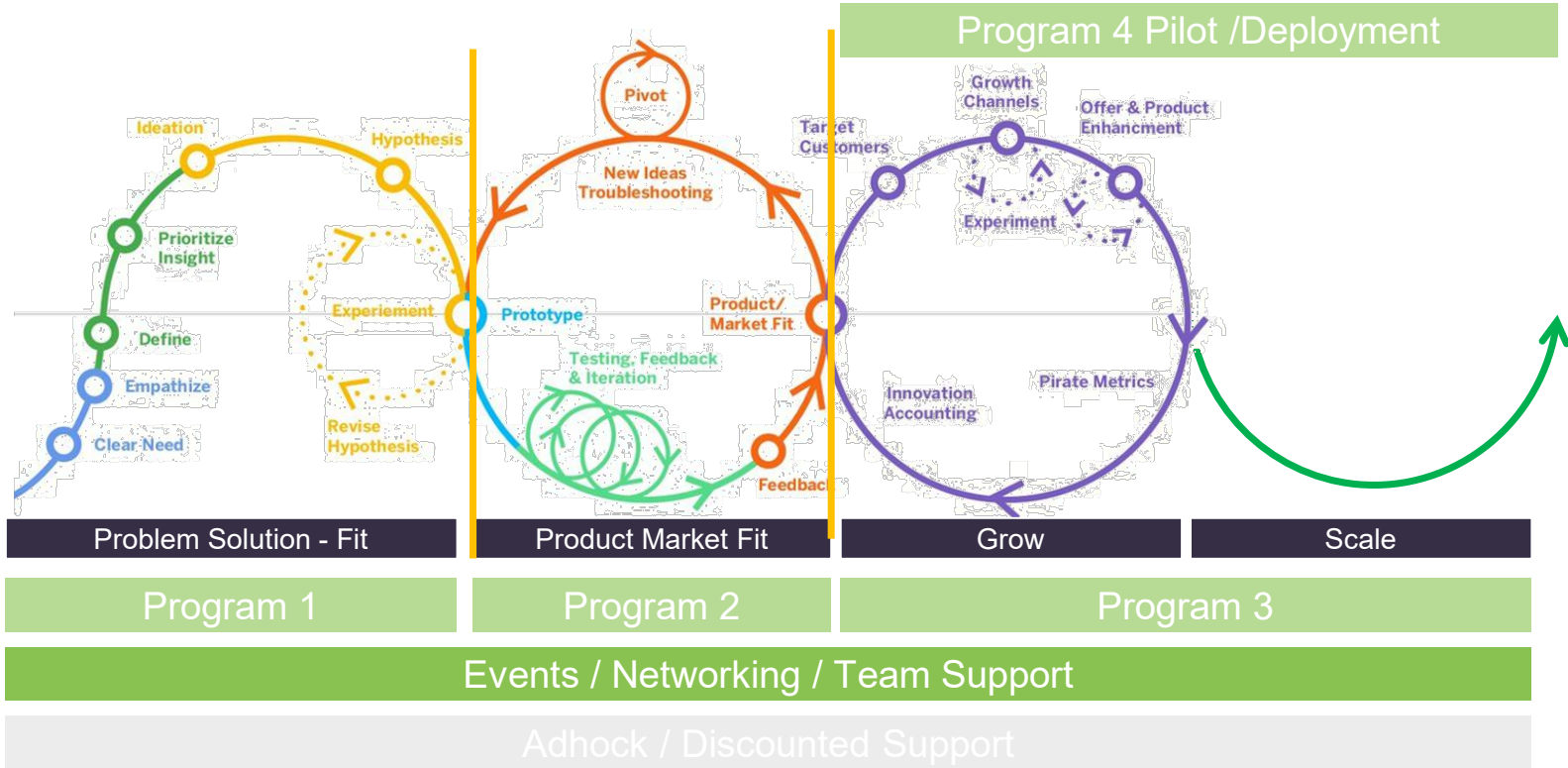
NO INVESTMENT

Less than 5% of Venture Capital funding goes to hardtech companies

**There is a clear gap in financing for hardware based companies...seed funds, angels, VC's, and other institutional investors are not investing in these important companies.**

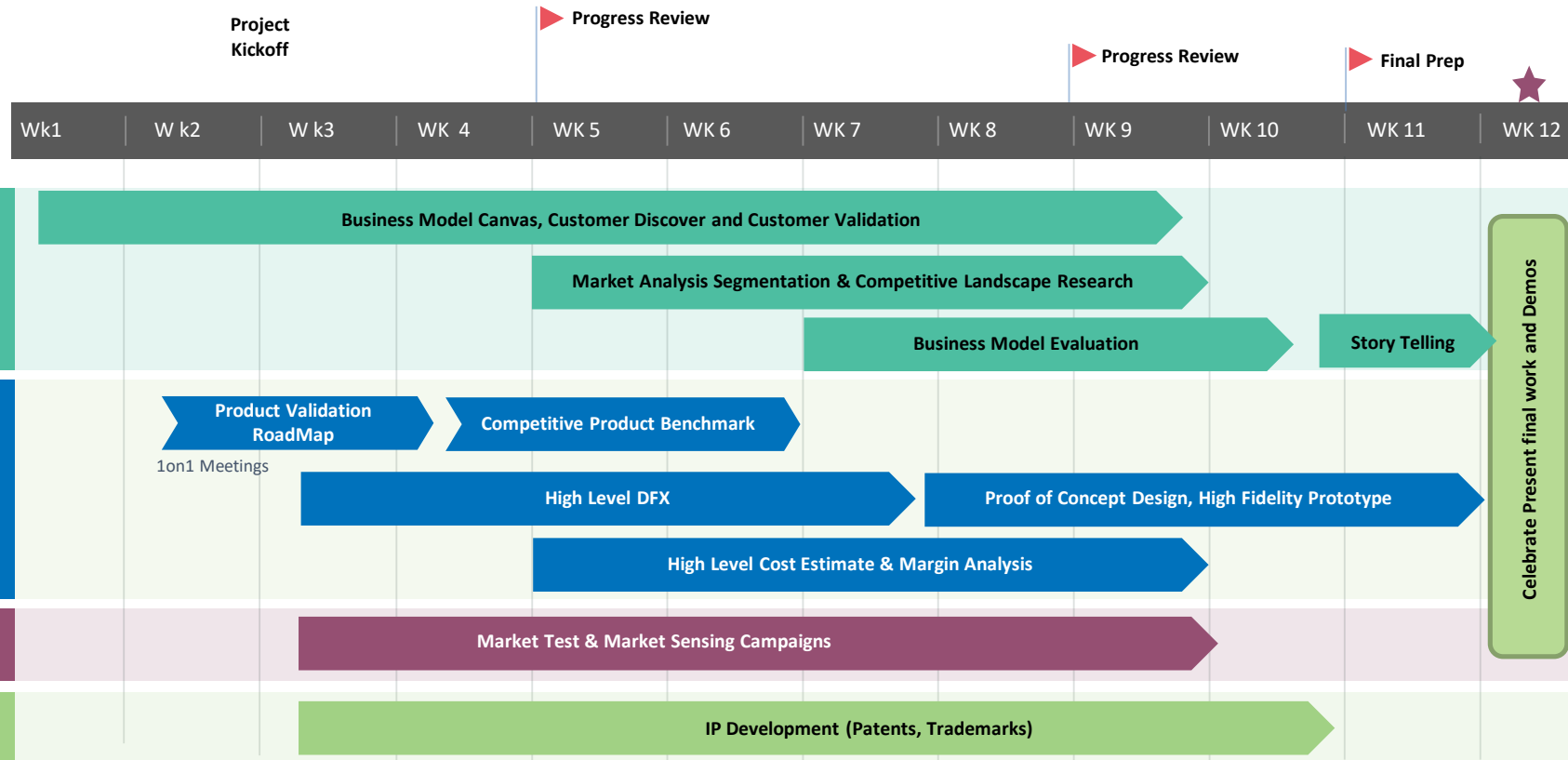


# Centrepolis Acceleration Program





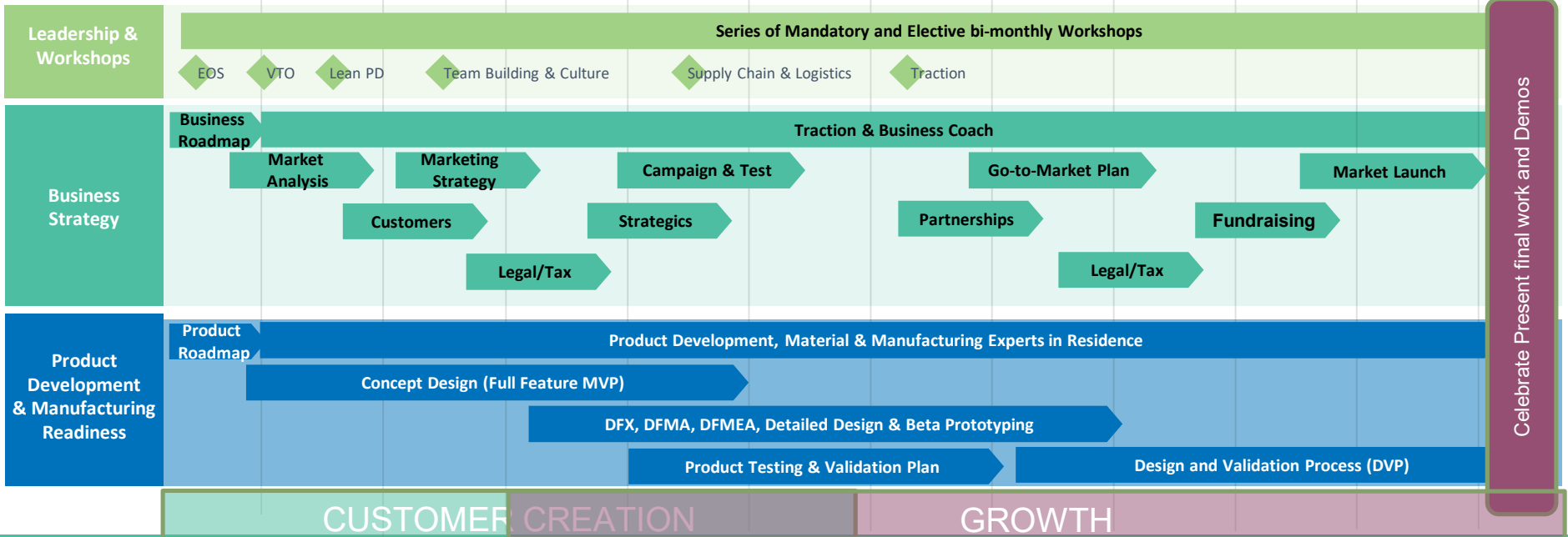
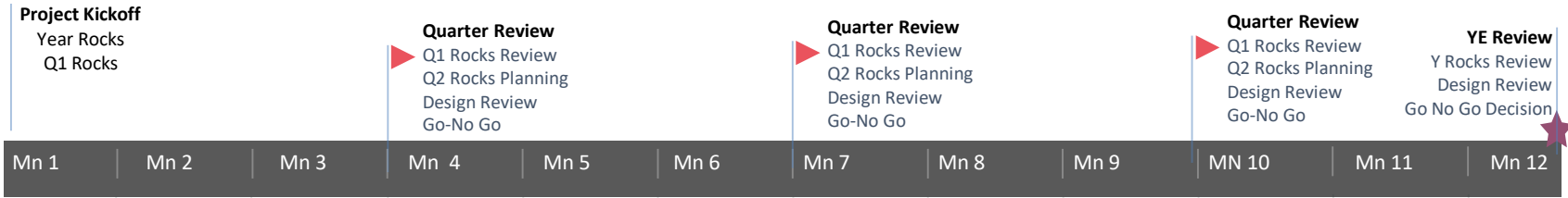
# Centrepolis Hardtech Idea to Product Program







# Centrepolis Product Development and Growth



Celebrate Present final work and Demos












# Client Training

## Product Development & Mfg 101

**Build4  
Scale**   
U.S. Department of Energy

Developed by  
Centrepolis  
Executive Director,  
Dan Radomski

 <p>0 Course Introduction</p>	 <p>1 Self-Assessment</p>	 <p>2 Detailed Design Package</p>
 <p>3 Design for Mfg, Assembly, &amp; Reliability</p>	 <p>4 Beta Prototype &amp; Test Plan</p>	 <p>5 Communication, Selection, &amp; Negotiation</p>
 <p>6 Regulation, Certification, &amp; Industry Stds</p>	 <p>7 Sustaining Quality &amp; Warranty Plan</p>	 <p>Resource Library</p>



# Client Support: Design for X

- **Design for Customer Use and Market Acceptance**
  - Customer use, interface, acceptance
  - Safety, ergonomics
  - Market regulations, certification requirements
- **Design for Manufacturability**
  - Reduce Bill of Material (BOM), evaluate material trade offs, cost reductions
  - Reduce Bill of Process (BOP) or process steps, reduce labor
  - Reduce capital equipment, tooling costs
  - Reduce scrap, improve yield
- **Design for Durability, Design for Operating Environment**
  - Consider noise, vibration, harshness (NVH), loading conditions, temperature operating environment, engineer for lifetime
- **Design for Assembly, Installation & System Integration**
  - Consider how the customer will assemble
  - Consider form/fit/function
  - Consider system operating dynamics, transient impacts on connecting components
- **Design for Maintenance and Serviceability**
  - Consider ease of service, repair
- **Design for Packaging and Logistics**
  - Consider product protection, shipping logistics
  - Consider storage, transportation costs
- **Design for Sustainability**
  - Consider use of bio-based materials, allow for recyclability, biodegradable products and packaging
  - Reduce waste materials in operations, cradle to cradle strategy for input to waste materials



# Manufacturing Experts in Residence



Michael Stone



Ashley Connelly



Daniel Hodges



Lee Gorman



Richard Broo



Ryan Waddington



Eric Drummond



David Bolognino



TeQuion Brookins



Bob Bedzyk



Bob Gaylen



Kerry Duggan



David Forman



Michael Magdich



Joshua Brugeman



Linda Fowler



Gerry Roston



Salim Momin



Sanjay Kumar



Dennis Shaver



Mike Sneller



Roland Kibler



Tina Williams



Scott Philips



Loch McCabe



Frank Ervin



Dave Stenson



Dawn White



Paul F. Skalny



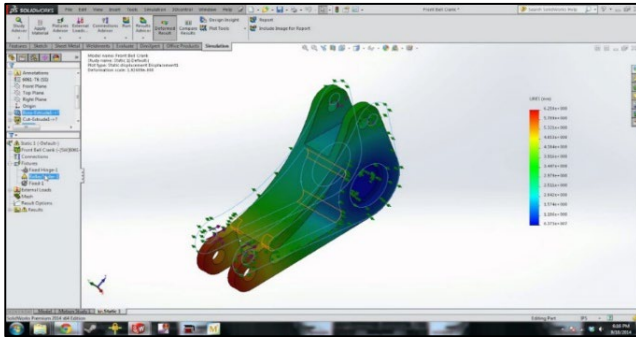
Ali Eidessouky

Our Experts-in-Residence provide over 25 years of experience in product design, engineering, prototyping, tooling, materials, manufacturing, supply chain, IP, business strategy, industry connections, marketing, and sales.





# In-House Design, Engineering & Prototyping



**Product Design & Engineering (CAD, FEA)**



**Prototyping Machine Shop**



**Hardware in the Loop Testing**



**3D Printing & Additive Manufacturing**



**Scanning Reverse Engineering**



**Co-Working Space**



# A Case Study in Tech Commercialization - Intecells



[Website](#)

Dr. Xiaohong Gayden  
Co-Founder



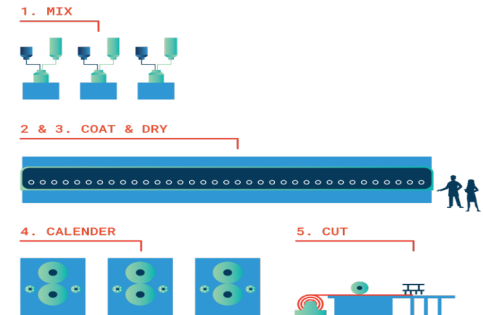
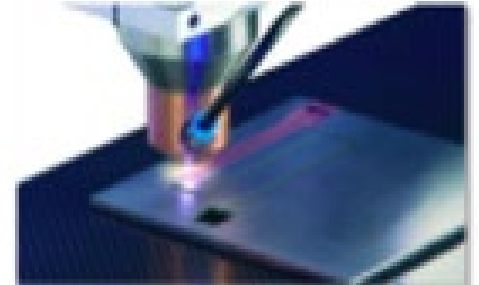
## Company/Product Description

Intecells (Troy, MI) is breaking the conventional battery manufacturing norms by building solutions at the intersection of battery manufacturing and cold plasma technology. Intecells develops and commercializes a scalable, solid-state battery manufacturing technology that offers a new pathway to new materials, novel form factors, and new applications for every kind of batteries in wearables, electronics, electric vehicles, and energy storage systems.

## The Story

- 6 Years in Operation
- Still at TRL 5
- No DOD or DOE grants
- Applied for several grants were not awarded
- No traction with defense contractors

## Photos/Videos





# A Case Study in Tech Commercialization - Marel Power Solutions



[Website](#)

**Amrit Vivekand**  
CEO



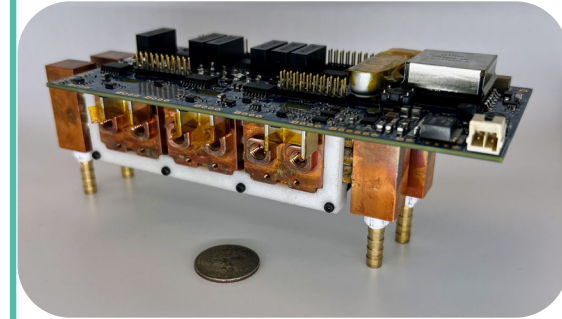
## Company/Product Description

Marel Power Solutions (Plymouth, MI) has developed a best in class packaging density power stack using SiC with patent pending module and thermal management architecture. This very impressive high voltage small package power electronics is designed for a wide variety of industry applications.

## The Story

- **4 Years in Operation**
- **Still at TRL 6**
- **No DOD grants**
- **Limited traction with defense contractors**

## Photos/Videos



	TODAY'S LEAD TECHNOLOGY		MAREL POWER STACK UNIT
$R_{TH-JC}$ (K/W)	0.1	-52%	0.048
Total Dissipation (W)	2500		5120
Dissipation per Die Area (W/cm <sup>2</sup> )	625	+105%	1280
Amps per Die (A)	70		105
Amps per Switch (A)	559	+50%	843



# Defense Hardtech Accelerator

## What it Does...

- 1) Identify hardtech innovations that support GVSC problem statements and innovation R&D roadmaps
- 2) Support internal innovations developed by GVSC staff
- 3) Work with existing GVSC IP to find ways to commercialize or transfer these technologies to industry

*Technologies that accelerate innovation in non tactical, tactical, combat vehicles and drones!*





# Defense Hardtech Accelerator

## What it Does...

Mission to get more products developed and manufactured domestically that address supply chain gap and are a defense and national security concern

### 1. Hardware

Any physical product with a focus on mobility, electrification and systems that support the war fighter

### 2. Advanced Materials

Next generation alloys, lightweight materials, nano materials, composites, coatings, natural chemical free and biobased solutions, natural fiber, recycled upcycled and circular economy (sustainable) materials innovations

### 3. Advanced Manufacturing Technologies

Next generation machinery, tooling, manufacturing processes, robotics, automation, AI, and Industry 4.0 technologies



# Defense Hardtech Accelerator Tech Focus...

## Mobility

- Vehicles such as AV, UGV, UAV, VTOL, Drones
- Physical systems that enable these such as powertrains and sensors (radar, lidar, cameras, ultrasound)
- Control systems that enable these sensors to integrate into the vehicles chassis, steering and braking systems.



# Defense Hardtech Accelerator Tech Focus...

## Electrification

- Vehicles such as BEV, HEV, PHEV, FCEV
- Batteries including the cells, modules, packs, BMS, thermal mgmt
- Electric drive and power electronics systems such as e-motors, gearbox, traction drive inverters, DC-DC converters, onboard battery chargers, electrical wiring, and off board EV charging systems.
- Fuel cells and electrolyzers

\*These systems are broadly applicable to defense tactical, non-tactical, combat vehicles as well as commercial class 1-8 vehicles including passenger, commercial, off road, agriculture, 2-3 wheel, marine, aircraft, rail, etc.



# Defense Hardtech Accelerator Tech Focus..

## Advanced Materials

- High strength metal alloys
- Composites (including natural fiber) and other materials that help lightweight vehicle structures, reducing mass that allows for better range for EVs or better fuel mileage for ICE's and Diesel systems.
- Material processing technologies that are critical to the electrified value chain and our defense security such as cobalt, nickel, lithium in batteries; neodymium in e-motors, semiconductors & microelectronics, power electronics (see Science Act [critical materials](#) list)



# Defense Hardtech Accelerator Tech Focus...

## Manufacturing Technology

- Innovations that improve the production of mobility and electrification systems, components and materials where the IP is on the manufacturing process
- Includes industry 4.0 technologies (e.g., automation, IIOT, generative AI)



# Defense Hardtech Accelerator

Addressing domestic critical supply chain gaps that are a defense and national security concern

- Hypersonics/Kinetics
- Semiconductors & Microelectronics
- Batteries & Energy Storage
- E-Motors
- Power Electronics
- Advanced Materials
- Casting Forgings



Dan Radomski, Executive Director

Centrepolis Accelerator @ Lawrence Technological University

21415 Civic Center Drive, Suite 100

Southfield, MI 48076

Phone: 248.721.3192

Email: [dradomski@ltu.edu](mailto:dradomski@ltu.edu)

LinkedIn: <https://www.linkedin.com/in/dan-radomski-418b693/>

Website: [centrepolisaccelerator.com](http://centrepolisaccelerator.com)



# Defense Hardtech Accelerator

We use a 7-step method to deliver these dual-use innovations to the Department of Defense while also fostering the growth of our dual-use ecosystem.

- 1) Analyze US Army Ground Vehicle Systems Center (GVSC) R&D Roadmaps & IP
  - Conduct a thorough evaluation of existing project-related roadmaps to identify major milestones, gaps, and roadblocks to reaching roadmap goals and priorities.
- 2) Meet with GVSC Technical Leads
  - 1on1 meetings with R&D leads of batteries, microgrids, electronics, advanced materials, lightweighting, manufacturing systems, cybersecurity, etc. Understand problem statements, innovation focus areas, internal IP, promising tech companies they would like to see us support.
- 3) Centrepolis to identify globally best in class technologies that align with GVSC interest
  - Vet and evaluate tech for defense applications, seek feedback from GVSC staff, down select companies to provide technical assistance to support CRL/TRL/MRLs.
- 4) Centrepolis to evaluate GVSC internal innovations and IP positions
  - Evaluate commercial viability for dual purpose applications





# Defense Hardtech Accelerator

We use a 7-step method to deliver these dual-use innovations to the Department of Defense while also fostering the growth of our dual-use ecosystem.

## 5) Centrepolis Technical Assistance

- We will down select tech companies and GVSC innovators and IP and provide technical expertise and direction to support CRL/TRL/MRLs through our Acceleration programs.

## 6) Develop partnerships between the Defense Department and the private sector

- Connect defense tech companies with GVSC, primes, other in value chain that can streamline their pathway to market with strategic market channel partnerships.

## 7) Record case studies and impact

- Identify and document relevant case studies, tech commercialization metrics and best practices as well as prepare and disseminate acceleration program outcomes to GVSC an our various stakeholders.



# Defense Hardtech Accelerator Services Provided...

- Product design, engineering, prototyping and manufacturing readiness services
- Service investments of \$100,000 per company to develop products
- Design for Manufacturability and Assembly Assessments (DFMA)
- Design for Failure Mode Effects and Analysis Assessments (DFMEA)
- Commercial / Technical / Manufacturing Readiness Assessment & Milestone Planning Tool
- Hardtech cohort bootcamps for both early stage and later stage firms
- Business strategy support (business plan, executive summary, pitch deck)
- Intellectual property (patent, trademark) strategy support
- Connections to design, engineering, testing, prototyping and manufacturing suppliers
- Advisory services from EiRs, mentors & founders



# Defense Hardtech Accelerator Services Provided...

- Access to \$50,000 Business Accelerator Fund and other grant/loan programs
- Funding strategy and introductions to investors
- SBIR training and grant writing services
- Securing funding available through the statewide startup ecosystem
- Discounts on co-working or office space at Centrepolis Accelerator
- Free registration for Centrepolis led events and workshops as approved by Centrepolis
- Introductions to industry partners (potential customers, vendors, distributors, partners, etc.)
- Discounted services from Centrepolis partner network
- Business operations and investment templates (Operating agreements, term sheets, joint venture agreements) and Product Development & Manufacturing Document Templates and Guidance (BOM, DFMEA, PFMEA, Supplier Service Agreement).



# Defense Hardtech Accelerator

## **Deliverables:**

- Support 10-20 Defense Tech Companies run through our programs per year
- At least 5 case studies of varying defense technology acceleration projects per year
- Bi-annual & final reports summarizing project activities, metrics and outcomes



CLEANTECH • CLIMATECH • CIRCULAR ECONOMY

# *Accelerator*

*Powered by Centrepolis at Lawrence Technological University*

**Centrepolis Accelerator**

**Battery & Energy Storage Clients**



[Website](#)

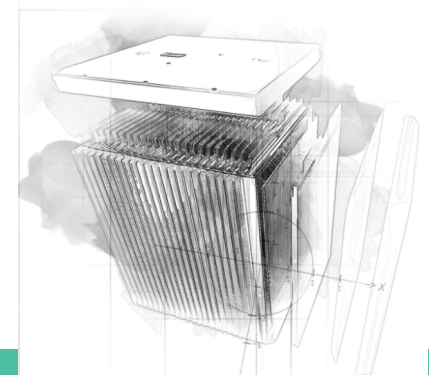
**Bill Koetting, President**



## Company/Product Description

Prime Energy (Troy, MI) is an established consulting service specializing in the design, testing, and development of energy storage and advanced technologies. Demonstrated success in leading innovative design solutions for both Product and Manufacturing applications, such as: Lithium module designs; Large Scale, Industrial and Automotive Energy Storage Systems; Developing pilot-line operations for prototype and production processes.

## Photos/Videos





[Website](#)

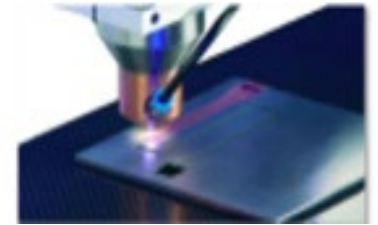
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Co-Founder



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### Photos/Videos





[Website](#)

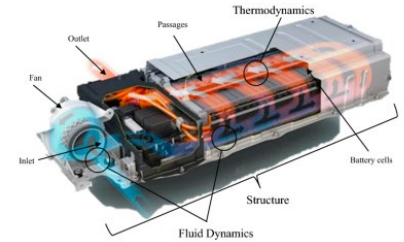
**Nathan Taylor, CEO**



### Company/Product Description

Zakuro (develops safe, affordable, solid-state batteries that enable the transition from fossil fuels to an electrified future.

### Photos/Videos







[Website](#)

**Ellington Ellis**  
Managing Partner & Co-  
Founder

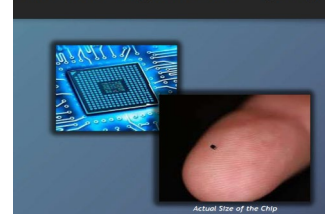


## Company/Product Description

GBS (Holland, MI) are experts in battery repair, remanufacturing, repurposing, and recycling. Evolving from an automotive OEM electronics repair service in 1958, GBS now provides unparalleled battery, electronics, and solar services. An innovation leader, they are creating a platform for next-gen battery life-cycle management, supported by our InCelligent Cell™ technology. They are also developing an impressive new Microprocessor chip to monitor health of the battery cell.

## Photos/Videos

GBS InCelligent Cell™ (ICC)





[Website](#)

**Mujeeb Ijaz, CEO**



## Company/Product Description

Our Next Energy (Novi, MI) is developing a novel two-pack structural battery design that is not reliant on nickel cobalt chemistries, and thus has more accessible materials and does not have the run-away thermal issues of many current EV battery designs. Their two-pack structure also extends range. Recently closed a funding round led by Bill Gates's Breakthrough Energy fund, BMW i Ventures, Volta Energy Technologies, Flex, and Detroit's newest mobility venture firm, Assembly Ventures.

## Photos/Videos





[Website](#)

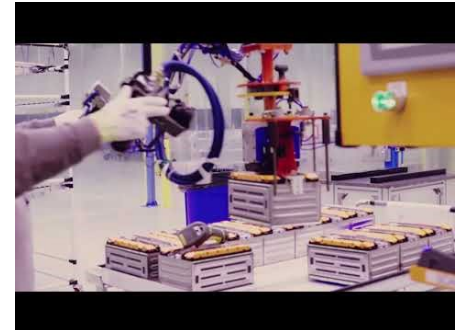
**Subhash Dhar,  
CEO**



## Company/Product Description

American Battery Solutions (Lake Orion, MI) is a team of battery system experts with decades of experience in designing, developing, and manufacturing advanced battery systems for the transportation industry. With an established manufacturing footprint in Ohio and an engineering center in Michigan with state-of-the-art testing facilities, ABS has assembled a world-class team of dedicated and experienced engineers.

## Photos/Videos





[Website](#)

**Thomas Bjarnemark**  
CEO



## Company/Product Description

Battery Solutions, LLC (Wixom, MI) serves environmentally-conscious corporations, governments, municipalities, and households across the country. Providing cost effective fully-managed battery-recycling kits, systems, and bulk recycling. We accept and recycle all battery chemistries and offer an array of handling services to satisfy our customers' needs while fully complying with government regulations.

## Photos/Videos





[Website](#)

**John Sapp**  
President & CEO



## Company/Product Description

Navitas Systems (Ann Arbor, MI) engages in the research, design, development, and manufacture of advanced lithium cells and energy storage products and systems for both commercial customers and U.S. Government/military customers. Navitas produces both small and large format lithium batteries for a range of high power and high energy applications; battery management systems with custom hardware/firmware and communications; chargers and inverters; and power management systems.

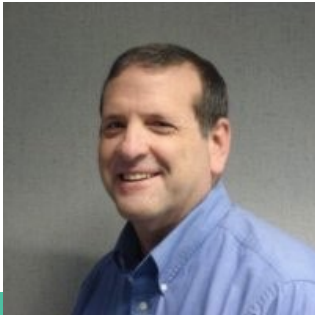
## Photos/Videos





[Website](#)

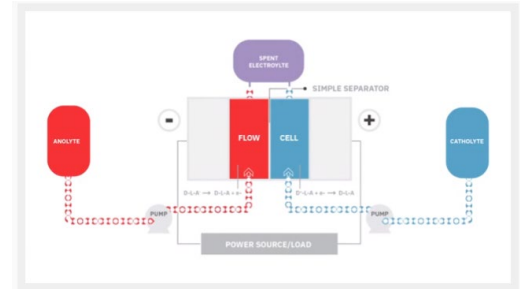
Tom Guarr, Co-Founder & CTO



## Company/Product Description

Jolt Energy (Holland, MI) is a start-up that focuses on concepts for organic redox flow batteries empower utilities to bring more new, renewable energy resources onto the grid. Our sustainable energy storage solutions will enable utilities to capture energy from intermittent energy sources, such as solar panels or wind farms, and reliably deliver that energy as soon as it's needed.

## Photos/Videos





[Website](#)

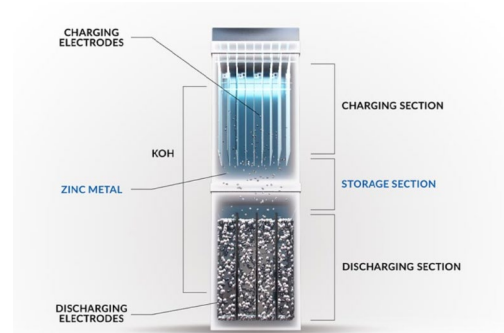
**James Larsen, CEO**



## Company/Product Description

eZinc (Toronto, Ontario) is a startup that provides a paradigm shift in energy storage. By storing electrical energy within zinc metal, the system can store hundreds of hours of energy capacity while being significantly cheaper than battery technologies. This has the potential to dramatically improve the value proposition of intermittent, renewable electricity sources such as wind and solar.

## Photos/Videos





[Website](#)

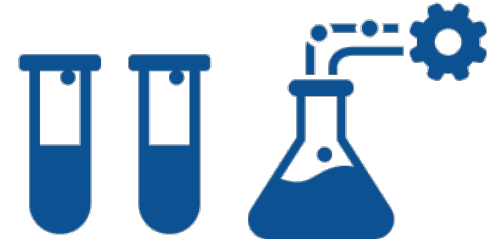
Michael O’Kronley, CEO



## Company/Product Description

Battery Resources (Boston, MA) is a developer of a battery resources technology designed to change the dynamics for processing end-of-life lithium-ion batteries. The company's technology uses hydro process recycling and direct recycling that takes old cathode material down to the atomic level to create new cathode materials, enabling clients to have maximum return on assets to economically drive recycling and low-cost battery materials.

## Photos/Videos





[Website](#)

**Dennis Atkinson**  
Co Founder



## Company/Product Description

e-cell secure (Detroit, MI) has developed state-of-the-industry fire management solutions and training processes geared to combat the energy storage system fire and shock hazard events. ESSPI™ offers a comprehensive package of equipment (systems), processes, and training that enables organizations from a wide range of industries to properly prepare for, combat and contain extremely dangerous and hazardous emergencies resulting from these fires.

## Photos/Videos

### Power Up Your Battery Safety



**Battery collection, transport and storage systems**

Battery fires, explosions and shock events can occur throughout battery supply chains. e-cell secure has developed patented, industry-first technologies and processes for collecting, shipping and storing batteries safely, efficiently and economically.



**Battery recycling logistics**

Batteries in the recycling life cycle represent an enormous safety risk. Our technologies and processes dramatically reduce these risks, from collection to the recycling process, and protect people and valuable business investments.



**Battery safety consulting and training**

e-cell secure has partnered with ESSPI to develop state-of-the-industry safety training and battery logistics support. We support industry through the development of battery-specific standard operating and emergency response tools.



[Website](#)

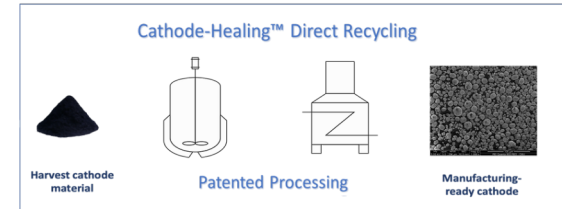
**Steve Sloop**  
CEO



## Company/Product Description

OnTo (Bend, OR) develops and patents advanced battery recycling innovations that produce manufacturing quality electrode materials from recycled batteries. These breakthrough technologies are available to serve the battery and environmental services industries. The new technology can reduce the cost of recycling and produce advanced materials for manufacturing batteries useful in applications from portable power to electric vehicles.

## Photos/Videos



# United Battery Recyclers International



[Website](#)

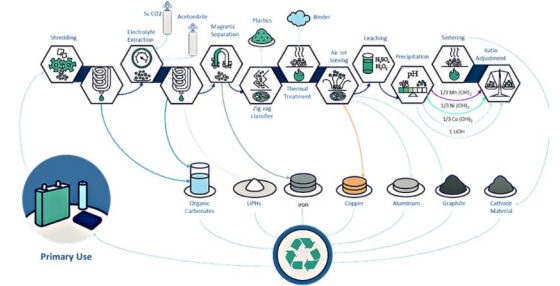
**Michael Czarnota**  
CEO



## Company/Product Description

United Battery Recyclers International (Detroit, MI) is a Michigan, ISO certified, supply chain provider of turn-key reuse, repurpose and recycling across all battery chemistries. UBRI develops customized, sustainable solutions that transform all types of batteries and related materials — from all parts of the world — to their next best use.

## Photos/Videos





[Website](#)

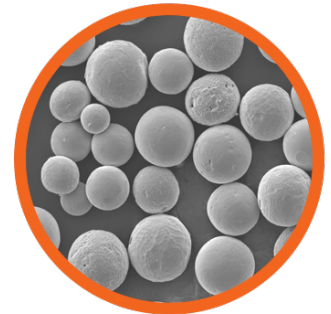
**George Meng**  
Director of Process  
Engineering



### Company/Product Description

6K Inc. (North Andover, MA) has developed a plasma-based synthetic route fundamentally that disrupts materials design and production for lithium ion batteries. They are also developing materials products for the current and next generation of battery technologies.

### Photos/Videos





[Website](#)

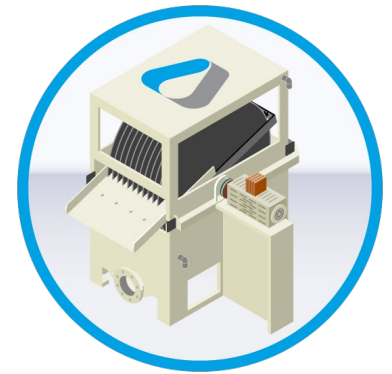
**Steve Cotton**  
President and CEO

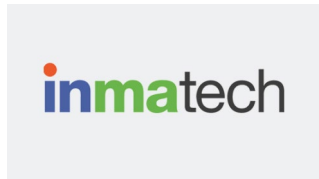


## Company/Product Description

Aqua Metals (Reno, NV) has created an Aquarefining system for recycling strategically critical metals from batteries that allows them to keep these in regional supply chains, reduces dependency risk, and environmental cost of relying on foreign sources. Their system involves no smelting, minimal waste, higher recovery percentage of metals, and higher quality of products.

## Photos/Videos





[Website](#)

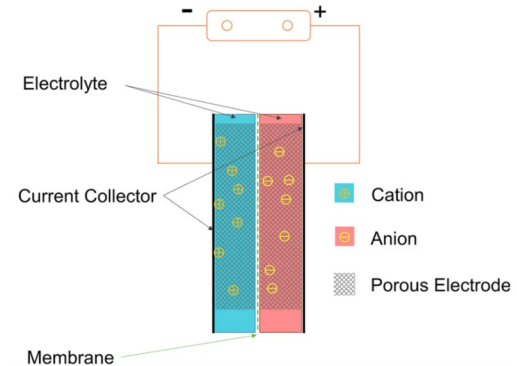
Dr. Saemin Choi, CEO



## Company/Product Description

Inmatech (Ann Arbor, MI) is a University of Michigan start-up that commercializes high-performance supercapacitors based on novel materials and asymmetric cell design to provide low-cost energy storage solutions for various markets including automotive, grid and military applications

## Photos/Videos





Dan Radomski, Executive Director

Centrepolis Accelerator @ Lawrence Technological University

21415 Civic Center Drive, Suite 100

Southfield, MI 48076

Phone: 248.721.3192

Email: [dradomski@ltu.edu](mailto:dradomski@ltu.edu)

LinkedIn: <https://www.linkedin.com/in/dan-radomski-418b693/>

Website: [centrepolisaccelerator.com](http://centrepolisaccelerator.com)