HYPERSONIC WEAPONS MARKET REPORT

Prepared by
The Institute for Defense & Government Advancement

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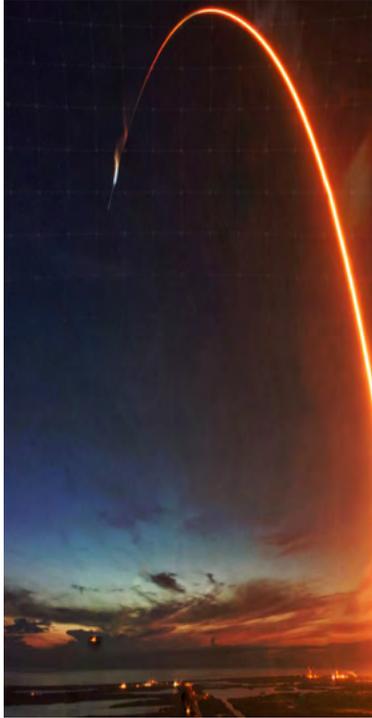
Next Frontier LLC

FEATURING AN EXCLUSIVE INTERVIEW WITH
DR. PRAKASH VEDULA
THE FOUNDER, CEO AND CHIEF SCIENTIST OF NEXT FRONTIER LLC

Fueled by the Pentagon, emerging Service needs, and efforts made by near-peer adversaries, the development hypersonic weapons and systems is expanding at a rapid pace.

With the Pentagon's recent successful test of a hypersonic glide body earlier this year, the path to hypersonic deployment seems closer than ever for the United States. However, there are many technological and operational decisions to be made before fielding an operational weapon.

Meeting the pace at which the Services wants to test and field a hypersonic offensive capability will be a challenge, but doing so is critical to the National Defense Strategy of the United States Military.

This report will highlight the ongoing efforts across industry, academia, the Services, and our close working partner, Next Frontier LLC.

HTTPS://WWW.IDGA.ORG/EVENTS-HYPERSONICWEAPONS/ >> 1-800-882-8684 >> IDGA@IDGA.ORG

Next Frontier LLC is a promising startup focused on delivering much-needed innovative computational algorithms, software and services that rapidly enable advanced designs of next generation hypersonic vehicles, along with unique near real-time capabilities for prediction, control and decision making. The company's products and services have the potential to make a big impact not only by protecting US and allied nations from threats of hypersonic weapons but also by enabling US leadership in hypersonics. The company is currently supported by US Air Force.

Dr. Prakash Vedula is the Founder, CEO and Chief Scientist of Next Frontier LLC. He is also a tenured Full Professor in the School of Aerospace and Mechanical Engineering at University of Oklahoma, Norman. He is a renowned expert in fast and reliable computational algorithms applicable to a broad variety of complex systems, including hypersonic systems, and he succeeded in making pioneering contributions to very challenging computational problems. He has a stellar CV and his innovations were published in many reputed peer-reviewed scientific journals.

Dr. Prakash Vedula
Founder, CEO & Chief Scientist,
Next Frontier LLC

Tell us about the big picture here

We are in the business of innovation, and we believe that what we are offering is something very transformational! Our company is motivated to help establish US leadership in hypersonics. We want to ensure that the leadership position is sustainable in the long run. We can help US and allied nations in being better prepared with offensive and defensive solutions in hypersonic warfare. We can do all of this through our innovative algorithms, software products and related services, all of which can leverage AI and quantum computing capabilities. Our products and services that we envision can quickly deliver very unique and many necessary capabilities in the context of hypersonic weapons, systems or platforms.

Mind sharing a few examples?

At its core, our software based solutions can enable advanced designs of hypersonic vehicles in a short time frame and at significantly reduced costs. We can deliver near-real time capabilities for prediction, control, sensor information fusion and decision making. In particular, we can enable fast and thoughtful decision making for human leaders and autonomous systems in complex scenarios relevant to hypersonic warfare. We can also deliver new capabilities for fully networked command and control across all domains of defense. We want to ensure that that our software is compatible with existing and legacy systems. In some ways, we are actually encouraging competition among different competing softwares and we're saying "let the better player win."

In addition to being the founder of Next Frontier LLC, you're also a tenured Full Professor at the University of Oklahoma's School of Aerospace and Mechanical Engineering. What motivated you to start Next Frontier LLC and how does it relate back to your work in academia?

That's a great question! At the University, my research group mostly focuses on addressing scientific and technological challenges relevant to a broad class of complex systems in engineering. Some examples of such complex systems include hypersonic systems, space shuttles, nuclear reactors, gas turbine engines, power plants to name a few. One of our research objectives is to enable development of intelligent and energy-efficient complex systems via integration of fundamental knowledge with fast, efficient and reliable computational algorithms.

As part of this effort, we proposed several innovative solutions or algorithms that address some key underlying challenges relevant to many complex systems in order to enable efficient designs and capabilities for fast, reliable, real-time prediction, control, sensor information fusion, uncertainty management and decision making. A lot of the foundational work was published in several peer-reviewed scientific journals. And, some of this research was funded directly or indirectly through US Air Force, Army, Navy, NASA and the National Science Foundation.

In many cases, the interaction of subcomponents of these complex systems is quite involved and the effects of these subcomponents cannot be easily isolated. Hence, well-known "text-book" solutions are not always adequate. We believe that a thoughtful balance between innovation and integration is needed to successfully deliver solutions to such complex systems. Our nuanced approaches of handling technical challenges associated with complex system integration could potentially help prevent failures in flight testing and could accelerate time to deployment of smart hypersonic systems.

When I came across the perception that United States was perhaps not the leader in hypersonic systems, I realized that there was a real opportunity to make a big impact by helping the US government and companies with some unique product offerings based on many years of research. That's how my company, Next Frontier LLC, got started. And, we are very confident that Next Frontier LLC can deliver some vital components needed towards establishing US leadership in hypersonics and sustaining it in the long run through our innovations relevant to hypersonics, AI and quantum computing.

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Your company received around a million dollars in funding from US Air Force. How did that support help your company's product development?

We are very grateful for the financial support provided by US Air Force. Their support has really helped us build the core foundation of our product. It enabled us to build innovative software for very reliable modeling and simulation of complex hypersonic flow environments. By accounting for complex multiscale phenomena involving fluid dynamics and detailed chemical interactions (using high-order accurate descriptions) our software enables very precise predictions of aerothermodynamic and thermal behaviors of hypersonic vehicles.

> *Our solutions can help the hypersonic hardware manufacturers gain their competitive edge and dominate niche markets*

Another unique aspect of this software is its ability to conduct detailed aero-optics analysis and electromagnetic signal analysis in extreme flow environments. Further, with the use of AI and other reduced order models we demonstrated that it is possible to significantly accelerate simulations by several orders of magnitude (in some cases). Whether one is interested in designing a hypersonic flight mission, or a hypersonic flight test or whether one is interested in interception of a hypersonic weapon, it is very important to quickly know (within a matter of seconds or less) the correct answers regarding vehicle response by considering various environmental complexities: this is where our core product could really help.

There are several important subtleties in our computational approaches that enable us to better represent reality within the limiting constraints of time. These will ensure successful designs of flight tests and timely deployment of intelligent hypersonic weapon systems of interest to US DoD.

Accuracy, range and speed are key design drivers for guided weaponry, relevant to hypersonics. How can AI help there from both an engineering/design standpoint as well as cost/efficiency? How does your company plan to leverage AI?

AI and machine learning tools can certainly help in enhancing performance of guided weaponry in hypersonics. They can be used to accomplish or replicate complicated tasks very quickly. For instance, in some cases we found our computer simulations of hypersonic flows to be several orders of magnitude faster when integrated with machine learning tools. Such enhanced speedup is vital not-only for cutting down the design time/costs but is also very valuable in real-time applications relevant to autonomous control and decision making.

While the buzz around machine learning based technologies might be alluring, it is important to understand their limitations. For machine learning based technologies to be useful, often the data that is used to train these systems should be very reliable and abundant. For hypersonic systems (and many other complex systems), such data is not readily available. This limitation can be addressed by having very reliable predictive modeling and simulation capabilities that accurately represent the underlying flow and environmental complexities, including effects on electromagnetic signals. This is one area where our core product attempts to distinguish itself from most of its competitors, by providing data through fast and reliable predictive simulations.

Our position is that a sustainable advantage over adversaries is unlikely to be attained via a straightforward merging/integration of commonly available, off-the shelf machine learning tools and existing hypersonic simulators in the marketplace. We believe that over approach for product development focused on targeted innovations in algorithms and hardware in the specific context of hypersonics and machine learning could deliver sustainable superiority in terms of weaponry. This aligns with our philosophy of innovate-first (in a big way) and then integrate to deliver.

We are also currently developing new machine learning tools relevant to hypersonics that can quickly capture complex interactions to a greater degree of accuracy by embedding appropriate physics based information and fundamental symmetries.

Building off of these next-generation technologies, where do you see the role of quantum computing in hypersonics?

It's well known that quantum computing would open up new possibilities of solving a broad class of really challenging problems very quickly; where even the most powerful classical supercomputers would fail miserably in terms of speed. In classical computing, a bit is a fundamental unit of information. One can think of it as a switch in an on or off state (either 0 or 1). Quantum computers deal with qubits (or quantum bits) that represent combinations of 0 and 1 states at the same time, via quantum superposition.

The possibility of achieving exponential speedup makes quantum computing very attractive. Quantum computers that can handle real-world problems of interest in hypersonics and other areas of engineering are not yet there. There are also problems that need to be addressed, especially in the context of quantum decoherence. Hopefully some of these issues would be addressed in the near future.

At my company and in my research group, we are interested in applications of quantum computing and quantum cryptography related to hypersonics and other areas. Recently we published a paper on the use of quantum computation for trajectory optimization. We are also developing new quantum algorithms for handling problems manifesting in wide class of differential equations, including those relevant to fluid dynamics. We are not building the hardware for quantum computing. But we are hoping that our quantum algorithms would be ready for immediate real-world deployment in hypersonic, especially for near-real time applications including cybersecurity, as soon as the appropriate quantum computing hardware is ready.

In your opinion, how likely is it that hypersonic weapons will attain initial operating capability within the next 4 years? Furthermore, what are some of the ways this timeline could be accelerated?

I think it is possible to attain that kind of capability in the next 4 years with some good planning and execution. We want to go a step further and say that it is possible for US to attain superiority in hypersonics within the same timeframe. There are technical and non-technical challenges that need to be addressed in attaining a leadership position.

Our company can definitely help in addressing many of these challenges. In our view, this is a race against time that US can win. For this, we need to ensure that there is directed innovation, smart allocation of resources and a thoughtful collaboration between government, industry and academia.

We do have some ideas on how to accelerate the timeline that you mentioned. ● ● ●

Business as usual will not work. We have to start by asking some tough questions. We need talented and motivated people that can innovate across disciplinary boundaries. There needs to be a harmony between specialist and generalist ways of thinking and conscious efforts to handle compartmentalization of knowledge. In my research group, we actively consider these nuances and we strive to deliver on big innovation. We can help with the winning strategies needed under short time constraints.

Now that you've successfully demonstrated proof-of-concept, what's next for your product, particularly as it relates development, innovation, and expansion?

As far as next steps, we are working towards extending and perfecting the general capabilities of our products over a broad range of conditions/environments that current and future hypersonic vehicles could potentially encounter. We are interested in hypersonic systems moving in the range of Mach 5 to 30 and beyond. That speed roughly translates to 1 to 6 miles (or more) per second. We plan on building our products to handle major challenges associated with a number of areas.

Some of these areas include (and this is a long list) material selection; fluid-structure-thermal interactions; real-time capabilities for prediction, control, decision making, sensor information fusion; directed energy strikes in hypersonic flows; realistic hypersonic war gaming; readiness for hypersonic missile defense and countermeasures; fast processing of hypersonic threats; interoperability across multiple domains; command and control system processing and asset management solutions; efficient planning and execution of hypersonic intercept missions and space applications.

Our innovative products can help in significantly reducing the design cost and can enable fast, safe and reliable deployment of hypersonic weapon systems. Our upcoming products will also make it very easy for top military leaders, digital twins and autonomous systems to handle complexity, uncertainty and decision making especially in the context of hypersonics.

With that in mind, how do you hope and expect to contribute towards the DoD's efforts and success in ensuring safety of United States and allied nations?

We are building a suite of products that US and allied nations would absolutely want to have to ensure safety of their citizens in the context of hypersonic warfare. The product suite is backed by solid innovation and research, some of which has appeared in our peer-reviewed publications. Some institutions might relate to our sense of urgency to accelerate the product development and near term deployment within the next 3-4 years. I mentioned a lot of a lot of unique capabilities that we can offer. In particular, our product suite will enable advanced designs of smart hypersonic systems, along with real-time capabilities for prediction and control. It will also help equip top military leaders of US and allied nations with powerful decision making tools in the context of hypersonic offense and defense strategies.

We can help ensure timely delivery of a class of products to DoD agencies that will enable global leadership of United States in hypersonic warfare within a short time frame. We want to help ensure security, compatibility and inter-operability of existing/legacy DoD systems with our innovative products. We would like to help DoD in mitigating risks of failure in the context of hypersonics. If DoD already has a "Plan A" in place, we would like to provide DoD with "Plan B", based on our products and services, as a backup in case "Plan A" should fail to deliver on time. Our products and services could also be useful to several partner agencies including DoE, NASA and Space Force.

How can hardware manufacturers relevant to hypersonics benefit from Next Frontier LLC?

We want to help hardware manufacturers in US and allied nations and we want them to succeed. We can bring in new technical perspectives and solutions to their engineering teams and chief scientist offices. Our creative solutions, backed by thorough scientific research, along with AI and quantum computing, can help enable superior designs of hypersonics hardware, mitigate risks, reduce costs and ensure timely and successful deployment. Our solutions can help the hypersonics hardware manufacturers gain their competitive edge and in some cases can help them dominate niche markets.

Would your products and services be useful commercial space companies as well?

Absolutely! Our products and services would also be very helpful to commercial space and hypersonics businesses, including those interested in space tourism and hypersonic point-to-point travel.

How do you feel about the market potential in hypersonics in general? And, what can you tell us about your company's plans to tap into it?

On that topic I would like to commend you and your entire team for the excellent work behind IQPC's market reports and newsletters relevant to hypersonics. We were able to get a lot of valuable information and market perspectives from them.

Based on some Wall Street projections, we can infer that the market potential for hypersonics in general is upwards of a trillion dollars in annual sales within the next 20 years or so, if we factor in both the defense and commercial sectors worldwide. The market for hypersonics appears to be in growth phase now. We believe that our company is well positioned to tap into some of that market potential with some serious innovation. Besides, we also plan to create some new markets with some of our products.

Is your company also looking investments from other sources, to include VCs?

Yes, we are open to investments from various sources from government and private sector, including the likes of venture capital, private equity and joint venture agreements. We welcome investors to consider the potential opportunities here for big impact! We are particularly looking to explore opportunities with prospective investors who are not only in sync with our vision and values, but can also appreciate some of the issues related to national security.

Prakash, thanks for taking the time with us, best of luck with Next Frontier!

Next Frontier LLC

For more information about Next Frontier LLC, please email:

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Dr. Vedula's scientific publications can be

FOUND HERE

MARKET FORECASTING
BUDGETS AND EFFORTS

The increased spending in the development of hypersonic capabilities and missile systems is a massive trend we have seen across the Defense ecosystem in direct response to near-peer adversarial advancements regarding hypersonic weapons. **Hypersonic technology development across both offensive and defensive capacities has enabled next-generation munitions and missile defense capabilities and systems.** The associated market growth out of the BMDS and weapons system communities have been staggering and show no sign of slowing down.

Driven by the massive urgency in fielding global prompt strike capabilities before another nation, the growing number of partnerships between US Defense Industry companies in developing these hypersonic weapons is helping technological advancements in the industry, with most defense firms expecting continued and successful results behind the DoD's programs.

The DoD is also touting a successful test of a hypersonic glide body in a flight experiment conducted from the Pacific Missile Range Facility, Kauai, Hawaii this March. The U.S. Navy and U.S. Army jointly executed the launch of a common hypersonic glide body (C-HGB), which flew at hypersonic speed to a designated impact point, attributing to further market growth across the US Hypersonic market place.

DOMESTIC FY2021 BUDGET

For FY2021, the DoD has asked congress for nearly **$2.9 billion in funds to procure hypersonic weapons systems, which illustrates a 14% increase from the $2.5 billion** that the DoD requested for the current fiscal year.
The report claims that the DoD is looking for $3.2 billion for offensive and defensive missile programs in the next budget request. These funds are earmarked under the non-traditional, "left of launch" funding that covers long-range strike weapons.

With the current hypersonic spending reductions from agencies like DARPA, we are seeing major investments across the Army and Navy hypersonic portfolios, both of which nearly double for FY2021. More of the work from these research-driven agencies is being handed off to the Services as the community propels itself out of the labs and into prototyping.

Of this large request, the Navy accounts for the largest percentage of said funding, **increasing its allocation to $1 billion from $526 million**, which is mostly geared towards the submarine fired Conventional Prompt Strike Weapons that will be deployed for 2025. DoD agencies spent $31 million in 2020 wrapping up their portion of the Navy's Conventional Prompt Strike in 2020, but the whole program will be in the Navy budget as of 2021.

The Army has also **increased funding boosting their hypersonic funding from $441 million to $859 million**, This increase is driven by a massive jump in the Defense budget for a land based version of the common Army-Navy boost-glide weapon, the long range hypersonic weapon, resulting in the 51% increase.

The Air Force reducing it's funding from $848 million to $554 million as the result of program cancellations, most notably the Hypersonic Conventional Strike Weapon, which would have used a modified version of Army-built Common Glide Body. However, the Air Force decided to cancel HCSW and focus its efforts on the Air-launched Rapid Response Weapon.

INTERNATIONAL EFFORTS

China, Russia and India are investing a major portion of their missile defense budget to redesign Kill Vehicles, Multi-Mode Seekers, New Propellants and Navigation on Chip. We are seeing massive investment regarding Multi-object Kill Vehicle technology, high power lasers and persistent discrimination in the current and future MBDS architecture. The advanced technology investments are informed by capability gap assessments and focus on concepts that bring upgraded capability to the warfighter. The goal is to provide capabilities that enable the future BMDS to keep pace with new and evolving threats.

Russia recently claimed that they have hypersonic nuclear-capable missiles since early Jan 2020; and with these capabilities in place, they will be able to counter any hypersonic weapons by the time that the world's missile leaders fully develop hypersonic capabilities.

A top Chinese science institute has claimed progress in a scramjet program which Chinese media speculate could lead to critical advances in the development of China's hypersonic cruise missile, another type of hypersonic weapon that **is more powerful than China's DF-17 hypersonic glide-boost missile**.

Outside of the Russia & China near-peer development, we are seeing growth of hypersonic missiles in the international arena for both India and Japan. For the first time, Japan has outlined a program to grow out their own hypersonic weapons capabilities, indicating that the country is seeking growth across hypersonic capabilities.

India has conducted their own test as recent as last year; they had created the hypersonic technology demonstrator, however the demonstration failed due to technical problems.

This growth from both India and Japan indicates an advancing arms race, particularly one in Asia, heating up an already geopolitically challenged area as a result of near-peer advancement.

ARTIST RENDERING BY: TURBOSQUID

Tables and Graphics on Hypersonic Market Forecast:

Highlighted in the following tables and graphs are numbers related to the main market forecast and event based forecast. These tables and graphics are meant to shed light on the market size of Global Supersonic & Hypersonic weapons.

Table 1

Market Forecast – Global Supersonic & Hypersonic Weapons by Guidance System (U.S. $BN) 2019-2027

	2019	2020	2021	2022	2023	2024	2025	2026	2027	∑19-27	CAGR 19-27
Americas	4.3	4.5	4.9	5.5	5.5	6.0	6.0	5.9	7.2	49.8	6.7%
Europe	1.7	1.8	1.9	2.2	2.2	2.4	2.4	2.3	2.5	19.3	5.0%
Asia	3.1	3.3	3.6	4.0	4.0	4.4	4.4	4.2	5.0	35.9	6.1%
Middle East	1.1	1.2	1.3	1.4	1.5	1.6	1.6	1.5	2.0	13.3	7.4%
Africa	0.8	0.8	0.9	1.0	1.0	1.1	1.1	1.1	1.3	8.9	6.3%
TOTAL	11.0	11.5	12.6	14.0	14.2	15.5	15.5	15.0	18.0	127.3	6.3%

Americas Market Forecast will grow by 6.7% CAGR from 2019-2027, with a cumulative US $49.8 billion during this period.

Europe Market Forecast with grow by 5.0% CAGR from 2019-2027, with a Cumulative US $19.3 Billion during this period

Asia Market Forecast with brow by 6.1% CAGR from 2019-2029, with a cumulative US$35.9 Billion during this period

Middle East Market Forecast will grow by 7.4% CAGR from 2019-2027, with a cumulative US$13.3 Billion during this period

Africa Market Forecast will grow by 6.3% CAGR From 2019-2027, with a cumulative US$8.9Billion during this period
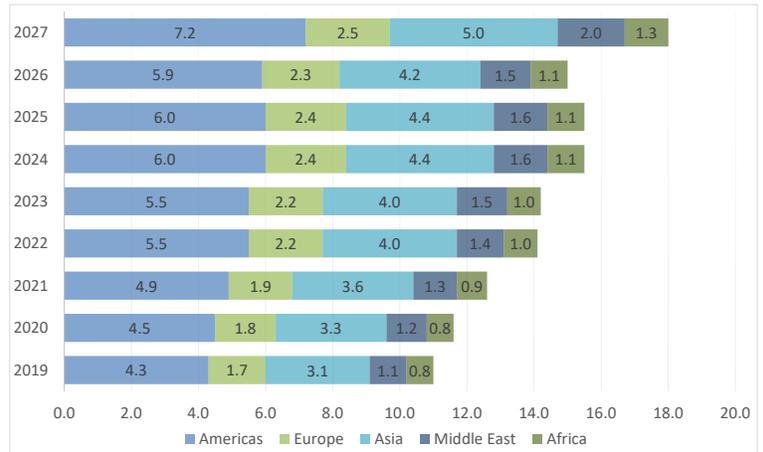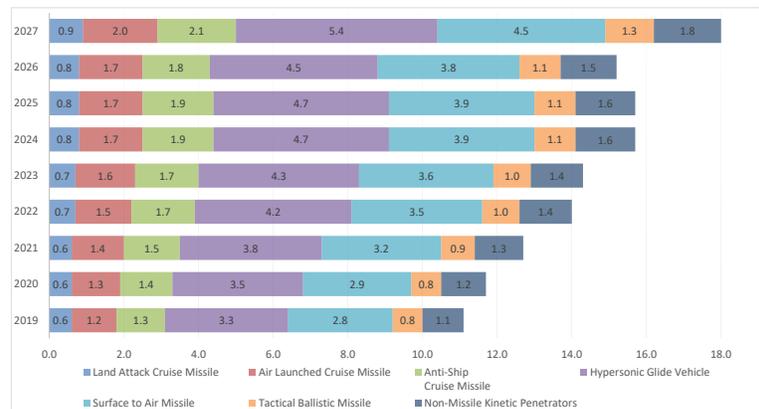
Table 2

Market Forecast Global Supersonic & Hypersonic Weapons by Regions (U.S. $BN) 2019-2027

	2019	2020	2021	2022	2023	2024	2025	2026	2027	∑19-27	CAGR 19-27
Land Attack Cruise Missile	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.9	6.4	6.3%
Air Launched Cruise Missile	1.2	1.3	1.4	1.5	1.6	1.7	1.7	1.7	2.0	14.1	6.7%
Anti-Ship Cruise Missile	1.3	1.4	1.5	1.7	1.7	1.9	1.9	1.8	2.1	15.2	6.0%
Hypersonic Glide Vehicle	3.3	3.5	3.8	4.2	4.3	4.7	4.7	4.5	5.4	38.2	6.3%
Surface to Air Missile	2.8	2.9	3.2	3.5	3.6	3.9	3.9	3.8	4.5	31.8	6.3%
Tactical Ballistic Missile	0.8	0.8	0.9	1.0	1.0	1.1	1.1	1.1	1.3	9.0	6.8%
Non-Missile Kinetic Penetrators	1.1	1.2	1.3	1.4	1.4	1.6	1.6	1.5	1.8	12.7	6.3%
TOTAL	11.0	11.5	12.6	14.0	14.2	15.5	15.5	15.0	18.0	127.3	6.3%

Table 3
Market Forecast – Global Supersonic & Hypersonic Weapons by Guidance System (U.S. $BN) 2019-2027

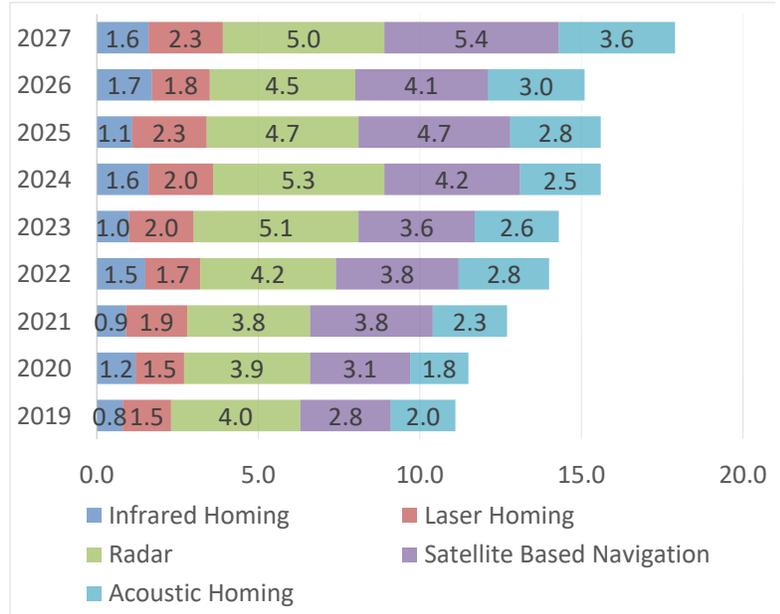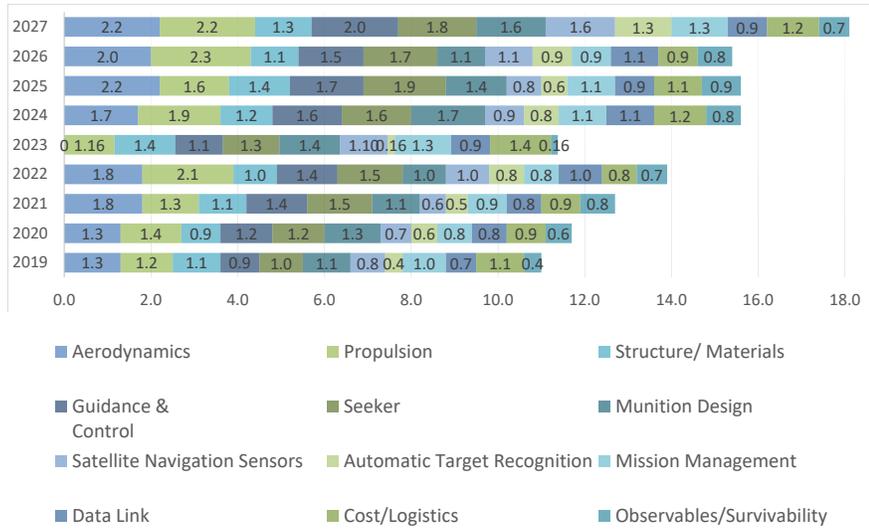|	2019	2020	2021	2022	2023	2024	2025	2026	2027	Σ19-27	CAGR 19-27
Infrared Homing	0.8	1.2	0.9	1.5	1.0	1.6	1.1	1.7	1.6	11.2	9.7%
Laser Homing	1.5	1.5	1.9	1.7	2.0	2.0	2.3	1.8	2.3	17.1	5.4%
Radar	4.0	3.9	3.8	4.2	5.1	5.3	4.7	4.5	5.0	40.4	3.1%
Satellite Based Navigation	2.8	3.1	3.8	3.8	3.6	4.2	4.7	4.1	5.4	35.3	8.8%
Acoustic Homing	2.0	1.8	2.3	2.8	2.6	2.5	2.8	3.0	3.6	23.3	7.8%
TOTAL	11.0	11.5	12.6	14.0	14.2	15.5	15.5	15.0	18.0	127.3	6.3%

Table 4
Market Forecast Global Supersonic & Hypersonic Weapons by Technologies (U.S. $BN) 2019-2027

	2019	2020	2021	2022	2023	2024	2025	2026	2027	Σ19-27	CAGR 19-27
Aerodynamics	1.3	1.3	1.8	1.8	1.7	1.7	2.2	2.0	2.2	15.9	6.6%
Propulsion	1.2	1.4	1.3	2.1	1.6	1.9	1.6	2.3	2.2	15.3	7.5%
Structure/ Materials	1.1	0.9	1.1	1.0	1.4	1.2	1.4	1.1	1.3	10.5	1.7%
Guidance & Control	0.9	1.2	1.4	1.4	1.1	1.6	1.7	1.5	2.0	12.7	10.7%
Seeker	1.0	1.2	1.5	1.5	1.3	1.6	1.9	1.7	1.8	13.3	7.8%
Munition Design	1.1	1.3	1.1	1.0	1.4	1.7	1.4	1.1	1.6	11.7	5.0%
Satellite Navigation Sensors	0.8	0.7	0.6	1.0	1.0	0.9	0.8	1.1	1.6	8.4	9.7%
Automatic Target Recognition	0.4	0.6	0.5	0.8	0.6	0.8	0.6	0.9	1.3	6.5	14.1%
Mission Management	1.0	0.8	0.9	0.8	1.3	1.1	1.1	0.9	1.3	9.1	3.1%
Data Link	0.7	0.8	0.8	1.0	0.9	1.1	0.9	1.1	0.9	8.0	4.0%
Cost/Logistics	1.1	0.9	0.9	0.8	1.4	1.2	1.1	0.9	1.2	9.6	1.1%
Observables /Survivability	0.4	0.6	0.8	0.7	0.6	0.8	0.9	0.8	0.7	6.2	6.3%
TOTAL	11.0	11.5	12.6	14.0	14.2	15.5	15.5	15.0	18.0	127.3	6.3%

All information presented in the graphs and tables on pages 8-9 of this report, are based on "Golobal Supersonic and Hypersonic weapons" report, April 2019, prepared by MARKET FORECAST

MARKET SURVEY FINDINGS

Based on a Market Survey conducted by IDGA, amongst 200+ attendees from US DoD/ Military, International Allies, Academia and industry from the Hypersonic Online Summit, March 31- April 1, 2020.
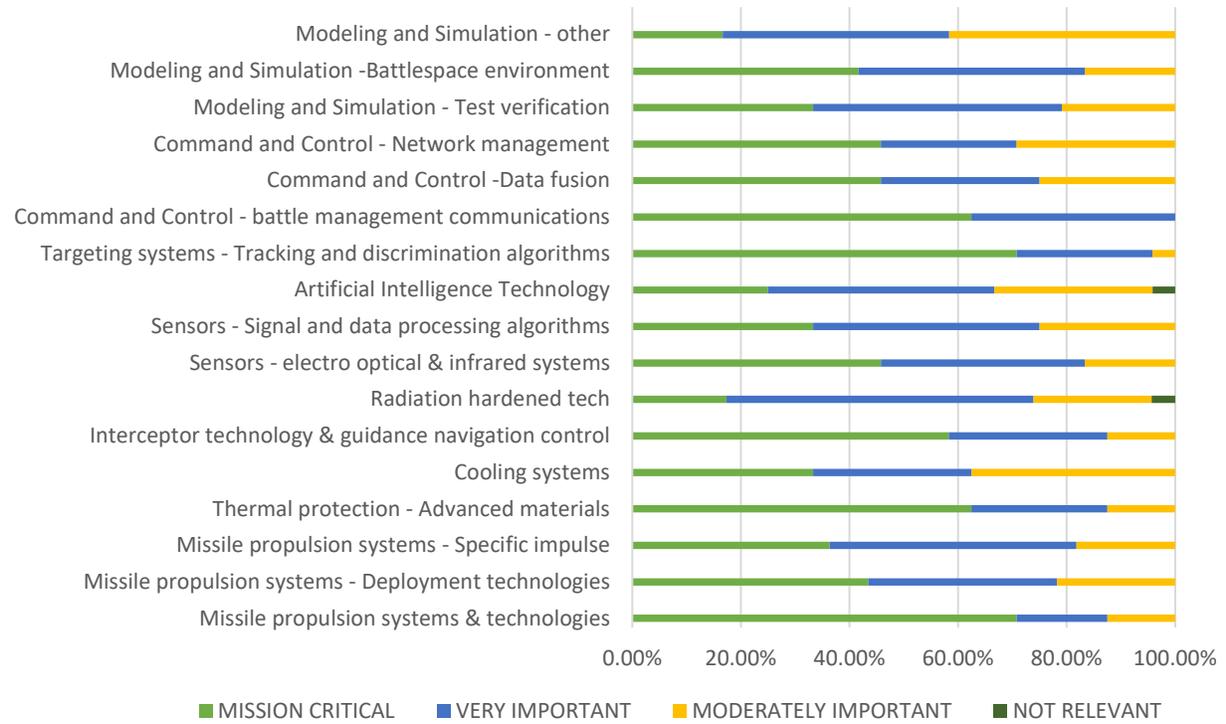

Legend:
- 0-6 months
- 12-18 months
- 6-12 months
- 18+ months

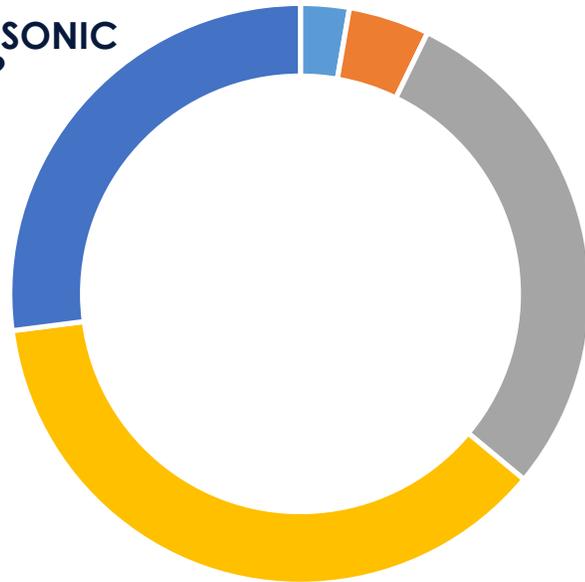## BASED ON CURRENT PROGRAMS AND INVESTMENTS, IN YOUR OPINION, HOW SOON WILL HYPERSONIC WEAPONS ATTAIN INITIAL OPERATING CAPABILITY?

WHEN IT COMES TO DEVELOPING & FIELDING HYPERSONIC WEAPONS, HOW WOULD YOU RANK THE IMPORTANCE OF THE FOLLOWING TECHNOLOGIES?

Chart categories (top to bottom):
- Modeling and Simulation - other
- Modeling and Simulation -Battlespace environment
- Modeling and Simulation - Test verification
- Command and Control - Network management
- Command and Control -Data fusion
- Command and Control - battle management communications
- Targeting systems - Tracking and discrimination algorithms
- Artificial Intelligence Technology
- Sensors - Signal and data processing algorithms
- Sensors - electro optical & infrared systems
- Radiation hardened tech
- Interceptor technology & guidance navigation control
- Cooling systems
- Thermal protection - Advanced materials
- Missile propulsion systems - Specific impulse
- Missile propulsion systems - Deployment technologies
- Missile propulsion systems & technologies

X-axis: 0.00% 20.00% 40.00% 60.00% 80.00% 100.00%

Legend:
- MISSION CRITICAL
- VERY IMPORTANT
- MODERATELY IMPORTANT
- NOT RELEVANT

HOW LIKELY ARE HYPERSONIC WEAPONS TO BE FIRED?

- Very unlikely
- Unlikely
- 50/50 – neither likely or unlikely
- Likely
- Extremely likely

WHAT WILL THE DEFENSE ECOSYSTEM LOOK LIKE POSTHYPERSONIC? WHAT TECHNOLOGICAL INVESTMENT AREAS WOULD BE RELEVANT TO YOU IN A WORLD WHERE HYPERSONIC THREATS ARE OPERATIONALIZED AND RELEVANT?

Interceptor technology development

AI Enabled Hypersonic Defense

Target Acquisition in Contested environments

Missile Detection & Tracking

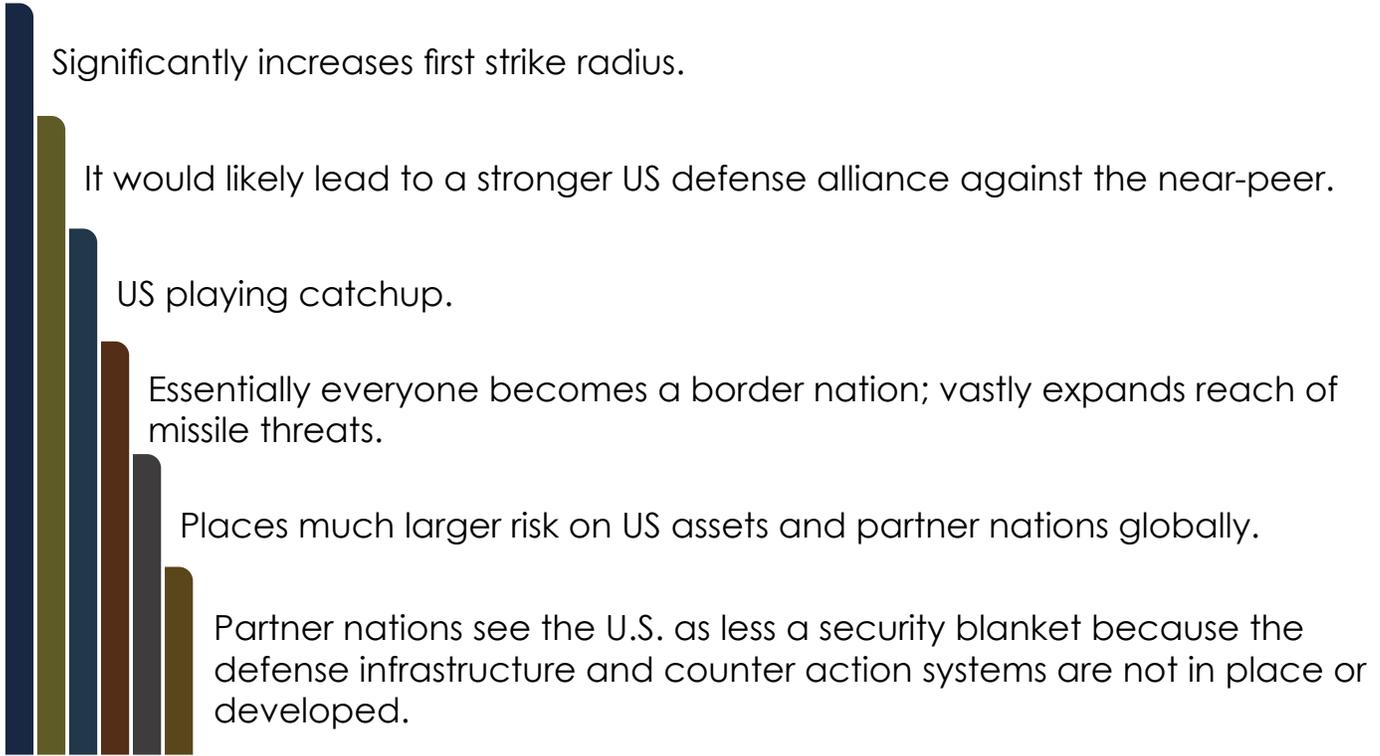Sensor Development for Space, Air, and Ground based

Propulsion

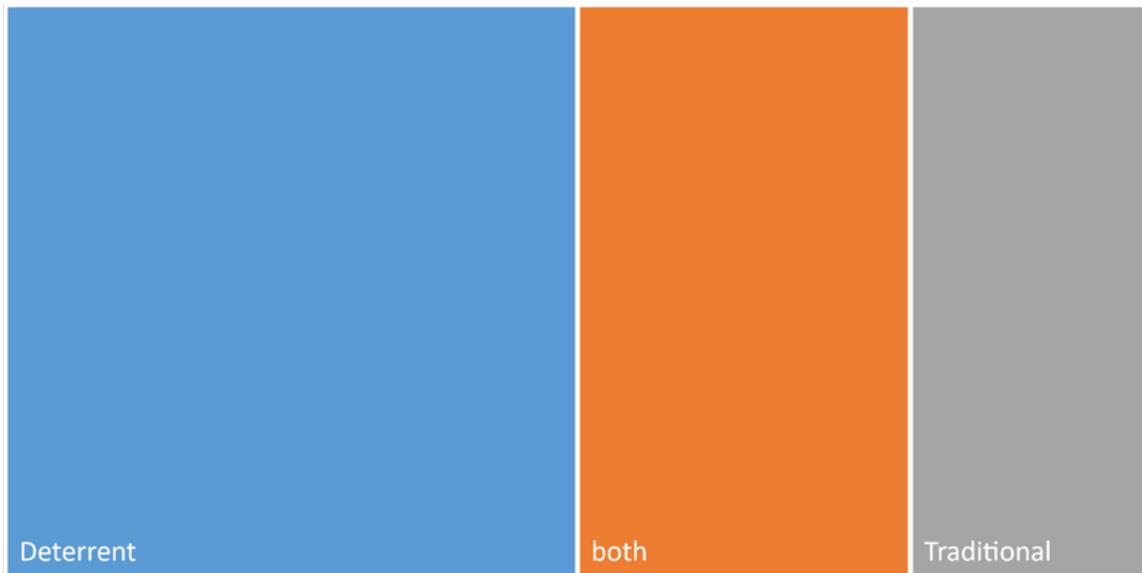Directed Energy Use Cases for Hyper Defense

WHAT WOULD THE GEOSTRATEGIC POLITICAL DEFENSE ENVIRONMENT LOOK LIKE IF A NEAR-PEER THREAT OBTAINED AND UTILIZED THIS CAPABILITY?

Significantly increases first strike radius.

It would likely lead to a stronger US defense alliance against the near-peer.

US playing catchup.

Essentially everyone becomes a border nation; vastly expands reach of missile threats.

Places much larger risk on US assets and partner nations globally.

Partner nations see the U.S. as less a security blanket because the defense infrastructure and counter action systems are not in place or developed.

HOW WILL HYPERSONIC WEAPONS BE USED? DO YOU SEE HYPERSONIC WEAPONS AS MORE OF A DETERRENT TECHNOLOGY OR A TECHNOLOGY TO BE UTILIZED IN TRADITIONAL OPERATIONS?

Deterrent	both	Traditional

JOIN THE DISCUSSION
LEARN ABOUT OUR PROGRAM

Join our Online Summit
October 28-30, 2020

THIS YEAR'S SUMMIT WILL COVER TOPICS INCLUDING:

- Enabling Hypersonic Capabilities Utilization for Warfighters across Multiple Domains
- Technology Investment Areas to Achieve Hypersonic Utilization
- Guiding Hypersonic Testing to Understand Technological Needs
- Bolstering Engineering and Manufacturing Processes
- Supporting Hypersonic Research & U.S. Collaboration to Meet Operational Requirements

COUNTER HYPERSONIC WEAPONS SUMMIT WILL DELIVER:

200+ *Attendees*

7+ *Hours of Networking*

15+ *Hours reserved for informational Content*

BENEFITS OF ATTENDING THE HYPERSONIC WEAPONS SUMMIT:

CONTENT
The Hypersonic Weapons Summit Summit will deliver senior-level briefings that provide a full viewpoint of the challenges and opportunities currently in the space. You can expect to hear from leaders and decision makers about what they view as the most imminent needs for the Hypersonic community and their acquisition, R&D, and S&T priorities in the near and long term.

NETWORKING
With each iteration of IDGA's Hypersonic Summits, we have grown not only in size, but diversity as well. This is the event of year to foster and develop relationship with key decision makers across the Services including our academic, industry and Federal Government partners.

EXPERIENCE
We at IDGA strive to provide our attendees an experience that enhances their learning opportunities, networking and general enjoyment. Customize your experience with interactive learning opportunities covering a wide array of hypersonic focused topics. Pick from a variety of sessions to make sure your event experience is tailored to your business development needs.

HYPERSONIC WEAPONS SUMMIT

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