



## *2023 State of the VITA Technology Industry*



May 2023

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# State of the VITA Technology Industry May 2023

by: Ray Alderman, Chairman of the Board, VITA

*This report provides the reader with updates on the state of the VITA Technology industry in particular and of the board and system industry in general, from the perspective of Ray Alderman, the Chairman of the Board of VITA. VITA is the trade association dedicated to fostering American National Standards Institute (ANSI) accredited, open system architectures in critical embedded system applications. The complete series of reports can be found at [Market Reports](http://www.VITA.com/Market_Reports). ([www.VITA.com/VITA\\_Technology\\_Industry](http://www.VITA.com/VITA_Technology_Industry))*

## Introduction

Inflation is still high throughout the world, but GDP is still growing. Interest rates are rising again, to get things under control. That's killing small banks and they are starting to fail regularly. The EV (electrical vehicle) is creating problems for the automakers, except Tesla, and some are starting to dump employees. There's a new diet coming from Europe that you need to try. And we look at the military markets from a different perspective. So, things are getting vague and uncertain again.

## Economic Conditions

Let's start from the top. U.S. GDP year-over-year grew at 2.1% in 2022 with inflation at 6.5%. China grew at 3.0% with inflation at 2%. Europe grew at 3.5% with inflation of 9.2%. UK growth was 4% in 2022 with inflation at about 10%. Russian GDP declined by 2.1% with inflation at about 12%, if you believe the official numbers. Economists suspect that the Russian economy probably declined by 15%, with inflation at 30% in 2022.<sup>1</sup>

In Q1 2023, U.S.GDP grew at 1.1% with inflation at about 5.0%. China grew at 4.5% with inflation at about 1.3%, Europe grew at about 0.1% with inflation at about 7%. Russian GDP looks like it's down about 3% in Q1, with inflation at about 9%. UK growth in Q1 was about 0.1% with inflation staying at about 10%. The inflation winners so far this year are Venezuela at 1,100%, Argentina

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<sup>1</sup> Filip De Mott, "The Russian economy is much worse than it appears as Moscow's data is a 'collection of lies and distortions,' economist says", Markets Insiders, April 10, 2023, [https://markets.businessinsider.com/news/stocks/russia-economy-data-lies-propaganda-vladimir-putin-inflation-ukraine-sanctions-2023-4?\\_gl=1\\*r9nyyx\\*\\_ga\\*MjEwNzYzODI3NC4xNjg0MTU2NjIw\\*\\_ga\\_E21CV80ZCZ\\*MTY4MTE1NjYyMC4xLjEuMTY4MTE1NjcwMC40Ny4wLjA](https://markets.businessinsider.com/news/stocks/russia-economy-data-lies-propaganda-vladimir-putin-inflation-ukraine-sanctions-2023-4?_gl=1*r9nyyx*_ga*MjEwNzYzODI3NC4xNjg0MTU2NjIw*_ga_E21CV80ZCZ*MTY4MTE1NjYyMC4xLjEuMTY4MTE1NjcwMC40Ny4wLjA)

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at 103%, Turkey at 55% and Pakistan at over 30%. We are still seeing economic growth, but inflation is staying high in many parts of the world. Europe is particularly affected.<sup>2</sup>

Average U.S. interest rates have risen to over 5% in the past year. That has clobbered anyone holding loans or bonds paying 3% or less. We saw Silicon Valley Bank go belly-up and several other regional banks are in liquidity trouble. The second largest bank in Switzerland (Credit Suisse) wobbled, fell, and was purchased by UBS (the largest Swiss bank) in March.

The Federal Reserve raised rates by 0.25% again in early May, the 10th raise in a year, to counter inflation. Their job is to get inflation down to 2% (from 5.0% today). They must slow down the U.S. economy, raising interest rates is the only tool they have. That means we will see other banks and financial institutions holding low-interest-rate bonds and mortgages get into trouble, and we will see unemployment rise from the present 3.5% to 4% or more. In Q1, we saw 183 corporate bankruptcy filings, more than any period in the past 12 years.<sup>3</sup> We could see more in the next few months if the Fed raises rates again later this year.

Many of the major tech companies have announced a flurry of layoffs. The Covid lockdowns forced everyone to go online, so these companies went on an unbridled hiring spree after seeing huge spikes in demand. Now, they must dump thousands of people. Twitter has laid off 80% of their employees. Meta (Facebook) 24%, Salesforce 9%, Amazon 7%, Alphabet (Google) 6%, Microsoft 5%. The latest numbers stated that the techs have dumped over 150,000 people in the past few months.<sup>4</sup> As the world banks continue to raise interest rates, to control inflation by depressing economic activity, there's not much good economic news to talk about, so let's move on to other things.

President Biden cancelled the national Covid emergency but kept the national health emergency in place (it expires automatically in May). Daily and weekly Covid cases and deaths are no longer top news stories. Everybody has stacks of hand sanitizers and N95 face masks sitting on top of their refrigerators now. I think I counted four or five Covid shots we should have taken over the past 3 years (including the recommended covalent boosters). There's a new Covid variant running around these days: Arcturus, which seems to be milder than previous versions.<sup>5</sup>

Now, let's move on to my favorite slow-motion train wreck: the auto industry. Ford sold 61,575 electric vehicles in 2022 and lost \$2.1 billion on those sales. Ford loses \$9,000 on every EV they sell.<sup>6</sup> GM sold 39,096 EVs in 2022 and they lost about \$8,000 on each Bolt they sold. EVs are not profitable until you are selling about 1 million vehicles per year and only Tesla has those economies of scale right now (they sold 1.31 million EVs in 2022). In Q1 2023, GM sold 20,670 EVs replacing Ford who sold only 10,866.<sup>7</sup> For comparison, Tesla sold 422,000 EVs in Q1 2023. In April, GM offered their white-collar workers a buy-out to leave the company. About 5,000 employees took the deal.<sup>8</sup> Stellantis (the old Fiat-Chrysler) offered buy-outs to 33,500 employees in late April.<sup>9</sup> No announcements yet from Ford on any headcount reduction plans.

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2 Andy Bruce, "Analysis: Why is UK inflation so high?", Reuters, April 19, 2023,.

<https://www.reuters.com/markets/europe/why-is-uk-inflation-so-high-2023-04-19/>

3 Steve Gelsi "U.S. bankruptcies climbed in March, with SVB Financial Group leading the pack", Market Watch, April 11, 2023,

<https://www.marketwatch.com/story/u-s-bankruptcies-climbed-in-march-with-silicon-valley-bank-leading-the-pack-ebc3cbd5?mod=home-page>

4 Jyoti Mann "Meta is one of tech's most brutal job-choppers, axing a higher percentage of staff than Google and Microsoft", Business Insider, April 25, 2023, <https://www.businessinsider.com/meta-is-second-most-brutal-chopper-of-big-tech-firms-2023-4>

5 Madeleine Haase, "What Experts Want You to Know About Arcturus, the New COVID Variant", Prevention, April 15, 2023,

<https://www.prevention.com/health/health-conditions/a43592554/arcturus-xbb16-new-covid-variant-what-to-know/>

6 Michael Wayland, and John Rosevear, "Ford is about to break out big EV losses for the first time", CNBC, March 22, 2023,

<https://www.cnbc.com/2023/03/22/ford-to-break-out-ev-business.html>

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<https://www.cnbc.com/2023/04/04/gm-overtakes-ford-in-us-ev-sales-still-trails-tesla.html>

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9 David Shepardson, "Stellantis offering voluntary buyouts to 33,500 US employees", Reuters, April 26, 2023,

<https://www.reuters.com/business/autos-transportation/stellantis-offering-voluntary-exit-packages-33500-us-employees-2023-04-26/>

The average price of a new gas-powered car is about \$50,000. The average price of a new EV is about \$61,000 even though it contains about half the parts of a gas-powered vehicle. EVs don't need many mechanics, so the bottom will fall-out of their job security.<sup>10</sup> About 40% to 60% of the cost of an EV is the battery, driven by the prices for cobalt, nickel, and lithium.<sup>11</sup> And those prices won't come down very much as automakers increase production. Every country with a pick and a shovel is scouring their land for deposits of these minerals, to cash-in on the increased demand. Automakers are furiously designing new EVs that will sell for \$25,000 to \$30,000, but they are bare-bones vehicles that look like washing machines with headlights.<sup>12</sup>

Even after you buy an EV, you're going to have some problems. Wheels fall off due to cheap low-quality lug bolts (Toyota). Steering wheels come off in your hands while driving down the road (Tesla). Batteries catch on fire (several manufacturers). Good luck with finding a charging station when you take long trips. EVs don't charge quickly in the cold, and heat reduces the life of the batteries. Vehicle range drops by 30% to 50% in extreme heat or cold, or when you run the heater or air conditioner. EVs wear-out tires about 20% faster than gas vehicles (due to torque and higher weight). To get the advertised range of an EV, you must drive only in areas with a constant temperature of 70 degrees (F), with no hills, and keep the radio off.<sup>13</sup> I'll buy an EV when I can drive 500 miles on two AA batteries, with the AC and the radio on!

*"I'll buy an EV when I can drive 500 miles on two AA batteries, with the AC and the radio on!"*

So, let me leave you with this thought. Back in March, two AI algorithms (Bing-AI and ChatGPT-4) were given standard IQ tests. They scored an IQ of 114.<sup>14</sup> The average IQ of people in the U.S. is 97. Maybe the stockholders at Ford and GM should fire all their management and let AI algorithms run those companies? They couldn't do any worse.

## Technology

We've already been through the tribulations of the auto industry. Their problems are mostly economic now, not technical. But let's add a few more logs to that fire before we leave the topic. GM dropped their Camaro car lineup and Stellantis (the old Chrysler) dropped their Jeep Cherokee line. Additionally, they are dropping their Dodge Demon muscle cars.<sup>15</sup> So, automakers are starting to cull their herd of vehicles, to make way for a line of little ugly problematic unprofitable EVs.

Additionally, EVs pose a safety hazard to pedestrians, stationary property (like buildings), small children, and cute little animals because they are too heavy and hard to stop (according to the National Transportation Safety Board and the insurance companies). The average weight of an EV battery is about 1,000 lbs. in smaller cars.<sup>16</sup> The heaviest battery (2,923 lbs.) resides in a Hummer-EV (which weighs-in at 9,063 lbs. total). The range of an EV is directly proportional to the size and weight of the battery, which is why you see only one EV with a 500-mile range on the market (the Lucid Air with a range of 516 miles with the total vehicle weighing 5,200 lbs.). Insurance companies are totaling any EVs in a wreck rather than repairing them. If the battery pack has a scratch on it, it might burst into flame at some point in the future and the cost of replacement batteries is greater than the value of the car.

10 Cara Korte, "The future of the auto industry is electric. Will mechanics be out of work?", CBS News, April 21, 2023, <https://www.cbsnews.com/news/auto-industry-future-electric-will-mechanics-be-out-of-work/>

11 Paul Gilbert, "How Democrats' Push For Electric Cars Endangers National Security", The Federalist, April 28, 2023, <https://thefederalist.com/2023/04/28/how-democrats-push-for-electric-cars-endangers-national-security/>

12 Tim Mullaney, "The \$25,000 electric vehicle is coming, with big implications for the auto market and car buyers", CNBC April 16, 2023, <https://www.cnbc.com/2023/04/16/the-25000-ev-is-coming-with-big-implications-for-car-buyers.html>

13 Charlotte Argue, "To what degree does temperature impact EV range?" GEOTAB, February 6, 2023, <https://www.geotab.com/blog/ev-range/>

14 Brian Wang, "Bing AI and GPT4 Has an IQ of 114 and is Smarter Than the Average Human", Next Big Future, March 15, 2023, <https://www.nextbigfuture.com/2023/03/bing-ai-and-gpt4-has-an-iq-of-114-and-is-smarter-than-average-human.html>

15 James Gilboy, "The Jeep Cherokee Is Dead After 49 Years", The Drive, March 23, 2023, <https://www.thedrive.com/news/the-jeep-cherokee-is-dead-after-49-years>

16 Matthew Hart, "The Weight Of A Battery Can Vary: How Much Does An EV Battery Weigh?", Axlewise, May 10, 2023, <https://axlewise.com/electric-car-battery-weight/>



AI algorithms can create images from text input. One is called Midjourney. Create pictures of all U.S. presidents with mullet haircuts<sup>1</sup>, as muscular wrestlers<sup>2</sup>, or as as Pixar characters.<sup>3</sup> Some of these images are better in clarity and color than actual photographs!

1 <https://pleated-jeans.com/2023/03/03/presidents-with-mullets-funny/>

2 <https://pleated-jeans.com/2023/03/14/presidents-as-professional-wrestlers-ai-art/>

3 <https://www.dailymail.co.uk/news/article-11772339/Every-president-Pixar-character-AI-reimagines-Americas-46-leaders.html>

Finally, the old multi-level parking garages in big cities cannot support the weight of a bunch of EVs and could collapse, according to structural engineers. We saw one parking garage collapse in New York in March, but we don't know how many EVs were involved.<sup>17</sup> So, maintain your gas-powered car and don't park it in any multi-level parking garages. Or move to Wyoming. Their legislature has proposed to ban all EV sales in that state by 2035.<sup>18</sup> There is one important technical development with electric and gas vehicles. Ford has a patent application that will allow their cars to lock you out if you miss a payment. Once you get behind by a couple of months, the car will use its self-driving software and GPS system, and autonomously drive the vehicle to an impound lot (automated repossession).<sup>19</sup> This is a great example of using technology to solve financial problems.

The second most interesting slow-motion train wreck I have been watching is the Metaverse. Disney shuttered their Metaverse division in March.<sup>20</sup> If any company had a decent foundation for a successful Metaverse concept, it was Disney. Meta (Facebook) has spent over \$13 billion on their Metaverse project, with clunky graphics (characters with no legs) and unappealing environments. It looks like that money went right down the drain. Generative AI models like ChatGPT, Bing-AI, and X.AI (from Elon Musk) have overwhelmed the Metaverse idea. There are 50 or 60 of these new AI algorithms and websites in development.<sup>21</sup> Many of these models can actually write and debug code, so a lot of average programmers could be out of a job.

I played with ChatGPT-4 and asked it to write an article about the 2022 world military budgets. That version is only trained on data up through 2021, so it denied my request. The good folks at Open AI (the people who wrote and trained ChatGPT) are furiously training the algorithm on more recent data sets now and could release an upgrade later this year.

17 Ronny Reyes, "Heavy electric vehicles could put pressure on parking garages, experts warn", New York Post, April 19, 2023, <https://nypost.com/2023/04/19/electric-vehicles-could-put-pressure-on-parking-garages/#:~:text=Parking%20garages%20across%20the%20US,one%20person%20and%20injuring%20five.>

18 Lauren Sforza, "Wyoming lawmakers propose ban on electric vehicle sales", The Hill, January 16, 2023, <https://thehill.com/homenews/state-watch/3815311-wyoming-lawmakers-propose-ban-on-electric-vehicle-sales>

19 Sarah Jackson, "Ford wants to allow your car to lock you out — and even drive itself to an impound lot or scrapyard — if you miss payments", Business Insider, February 28, 2023, <https://www.businessinsider.com/ford-patent-cars-repossess-themselves-drive-away-if-missing-payments-2023-2>

20 Rebecca Bellan, "Disney cuts metaverse division as part of broader restructuring", Tech Crunch, March 27, 2023, <https://techcrunch.com/2023/03/27/disney-cuts-metaverse-division-as-part-of-broader-restructuring/>

21 Brian Wang, "Six Big AI Projects in the Race Beyond 2 Trillion Parameters", Next Big Future, April 8, 2023, <https://www.nextbigfuture.com/2023/04/six-big-ai-projects-in-the-race-beyond-2-trillion-parameters.html>

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Writers have used some AI algorithms to write stories and books, and then applied for copyrights. Artists have created images with AI algorithms using text descriptions and applied for copyrights too. And inventors have applied for patents for AI-generated inventions. The U.S.PTO (patent and trademark office) says that AI algorithms cannot be an inventor of a patent. Patents can only be granted to a person. Earlier this year, the U.S. Copyright Office ruled that AI-generated images, literature, and music cannot be copyrighted.<sup>22</sup> The courts will get involved in the AI issues soon, and they have no idea what AI is or what it does.

*“The courts will get involved in the AI issues soon, and they have no idea what AI is or what it does.”*

When government bureaucrats are confronted with something they don't understand, their normal reaction is to outlaw it, regulate it, or tax it. In early April, Italian authorities banned ChatGPT.<sup>23</sup> In April, EU lawyers started investigating AI algorithms for new regulations.<sup>24</sup> The National Telecommunications and Information Administration opened public comment on concerns and potential regulations for AI algorithms.<sup>25</sup> In late March, a group of concerned scientists wrote a letter requesting a 6-month “immediate pause” in AI development, before it gets out of control. With regulation comes severe financial penalties for violations, which is just another form of taxation. And with 50 to 60 generative AI algorithms in development, that's a target-rich environment for government bureaucrats. Want proof of my statements here? In the 2024 federal budget, there is a proposal for a 30% tax on the electricity used by crypto-mining machines.<sup>26</sup>

Let's move on to something more appetizing. Several authors have written books about the three major possible apocalypses for earth: a massive asteroid impact, a super volcano eruption, or nuclear war. All of these will block out 90% of the sunlight and destroy all plant matter, along with all the herbivores (like cows and pigs and sheep). So, we need an apocalypse diet for humans to survive.<sup>27</sup> That diet consists of rats, mushrooms, and bugs. Rats reach maturity at about 6 weeks and can produce about 7 to 9 offspring in another 70 days. So, in about 112 days, you can have a few pounds of meat. A rotting log 3 feet long and 4 inches wide will produce 2.2 pounds of mushrooms in about 4 years. And bugs will be everywhere, free for the taking if you are fast enough. Rats, mushrooms, and bugs don't need sunlight to survive. I have not found a good recipe for this combination of ingredients, but I am sure some of the survivalists are working on it!

This diet did not escape the attention of the bureaucrats in the EU. In early March, the food authorities in the European Union approved mealworms and crickets as food for humans.<sup>28</sup> These critters can be dried and ground into flour, and used to make breads, crackers, and cookies. In fact, look at “Chirp Chips”, a company that makes “Cricket Cookies”.<sup>29</sup> MMMmmm! There are already over 30 restaurants in California that feature bug-based items on their menu (no surprise there). If you're thinking about making a career change, look into the lucrative opportunities raising rats, bugs, or mushrooms.

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22 Sam Sachs, "US Copyright Office rules AI-generated artwork, content not legally protected", The Hill, March 24, 2023, <https://thehill.com/homenews/3872614-us-copyright-office-rules-ai-generated-artwork-content-not-legally-protected/>

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25 David Shepardson and Diane Bartz, "US begins study of possible rules to regulate AI like ChatGPT", Reuters, April 12, 2023, <https://www.reuters.com/technology/us-begins-study-possible-rules-regulate-ai-like-chatgpt-2023-04-11/>

26 James Broughel, "Biden's 30% Crypto Electricity Tax May Be Too Blunt A Solution", Forbes, March 15, 2023, <https://www.forbes.com/sites/jamesbroughel/2023/03/15/biden-shouldnt-tax-cryptos-electricity-use/?sh=18be075c6418>

27 Morgan McFall-Johnsen, "To survive nuclear apocalypse, you may have to eat nothing but mushrooms, rats, and insects", Business Insider, March 1, 2023, <https://www.businessinsider.com/after-asteroid-volcano-nuke-mushrooms-help-humans-survive-2019-9>

28 Jing Pan, "The edible bug business is set to take wing in the US and abroad as the EU clears crickets for human consumption — is this the low-cost, sustainable answer to soaring meat prices?", Yahoo Entertainment, March 3, 2023, <https://www.yahoo.com/entertainment/eu-just-approved-insects-human-183000591.html>

29 Chirps, <https://eatchirps.com>

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If rats or bugs don't appeal to you, then take a bite of these "Mammoth Meatballs" from Vow, a company in Australia.<sup>30</sup> They took the DNA from the extinct woolly mammoth, mixed it with the DNA from an elephant, put it into a sheep's cell, and let the cells grow into a glob of meat. I suspect it tastes like chicken.

Speaking of catastrophes, one of the authors of the books previously mentioned has come up with his latest list of possible apocalyptic events on a scale of 0 to 10 (where 0 is least likely and 10 is most likely).<sup>31</sup> He ranks an asteroid impact at 4, a super volcano eruption at 4, runaway artificial intelligence at 5, and an invasion of earth by space aliens at 6 (from deadly creatures floating around in space, called panspermia). A deadly pandemic, from some radical mutated virus, rated at 7.5. And nuclear war was the highest probability at 8. Interesting that an alien invasion of earth (a 6) ranks much higher in probability than global warming (a little above 2).

Then, there's the American Council of Science and Health's list of the top 10 technologies that will most affect our lives (until one of the previously mentioned catastrophes happen).<sup>32</sup> CRISPR (a tool that can manipulate human DNA) is rated #1, followed by AI algorithms. At #3 is the RISC-V CPU open standard. Like AI algorithms, the RISC-V model can be downloaded and manipulated so anyone can make their own computer chip. Military drones come in at #4. Anyone can take a commercial drone and turn it into a weapon by adding explosives, chemical agents, or deadly germs as a payload. It's interesting how some items on the technologies list map nicely on some items on the catastrophes list.

Speaking of alien invasions, the Director of National Intelligence released their second UFO report in January. It didn't tell us anything we didn't already know. Then, the AARO (All-domain Anomaly Resolution Office) announced in March that they have added 140 new UFO sightings to their list. They were investigating 510 incidents last August, and now it's up to 650 incidents.<sup>33</sup> Pentagon officials say there is still no proof of extraterrestrial involvement, so everyone should remain calm. But Sean Kirkpatrick (AARO director) did say that it's possible that an "artificial interstellar object" has flown through our solar system, dispensing many autonomous probes that collect data about the earth and the other planets. If this is true, then maybe those extraterrestrial xenomorphs, that don't exist according to the Pentagon, are tired of eating rats, mushrooms, and bugs, and they are looking for better food in our solar system? If rats, mushrooms, and bugs are on our menu, then maybe humans are on their menu? Go watch "To Serve Man", the season 3, episode 24 of "The Twilight Zone" (1962) for more clarity.

## Military

About a year ago, I started collecting all the market research reports about the military markets. I found 52 reports in 2022. In January 2023, I found seven, then another seven in February, seven again in March, and four in April. They cover different segments of the MIL industry (communications, radar, sonar, ground vehicles, satellites, ships, aircraft, drones, etc.). I have integrated this information in an article published in early May, to save you some reading time.<sup>34</sup> I am writing a series of articles integrating the military market reports (mentioned above) on each of the different segments.

In April, SIPRI (Stockholm International Peace Research Institute) released their reports on worldwide arms production and transfers in 2022.<sup>35</sup> In early summer, another publication will release the Defense Industry Top 100 military contractors list. And there are several websites that list the military-spending-to-GDP-ratios for all the countries in the world.

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30 Damian Carrington, "Meatball from long-extinct mammoth created by food firm", The Guardian, March 28, 2023, <https://www.theguardian.com/environment/2023/mar/28/meatball-mammoth-created-cultivated-meat-firm>

31 Dirk Schulze-Makuch, "How will the world end, naturally or by our own hands?", Big Think, March 13, 2023, <https://bigthink.com/the-future/apocalypse-from-nature-or-human-hands/>

32 Henry I. Miller, MS, MD, "10 Breakthrough Technologies That Will Profoundly Affect Our Lives", American Council on Science and Health, April 6, 2023, <https://www.acsh.org/news/2023/04/06/10-breakthrough-technologies-will-profoundly-affect-our-lives-16936>

33 Zamone Perez, "Pentagon UFO chief says alien mothership in our solar system possible", Military Times, March 9, 2023, <https://www.militarytimes.com/off-duty/military-culture/2023/03/09/pentagon-ufo-chief-says-alien-mothership-in-our-solar-system-possible/>

34 Ray Alderman, "The \$600 billion market for military weapons, sensor systems, and platforms", Military Embedded Systems, April 27, 2023, <https://militaryembedded.com/radar-ew/sensors/the-600-billion-market-for-military-weapons-sensor-systems-and-platforms>

35 Stockholm International Peace Research Institute, <https://www.sipri.org>

The largest volume platform segment is ground vehicles, to be covered in my June article. The Pentagon operates over 400,000 wheeled and tracked vehicles around the world and there are contracts in place and plans for thousands of new military combat vehicles. So, let's take a cursory look at that market segment here. According to sources on the web, the Pentagon operates more than 420,000 ground vehicles. About 170,000 of those are non-combat vehicles (staff cars, delivery vans, box-trucks, pick-up trucks, dump trucks, wreckers, etc.). The remaining 250,000 are weaponized for use in expeditionary operations and combat zones.



Photo courtesy of U.S. Army: Joint Light Tactical Vehicle (JLTV)

Non-combat vehicles are basically commercial vehicles (painted green) and not very interesting, so let's focus on the tactical vehicles used in combat. The highest volume vehicle for that environment is the Humvee. Since 1983, over 175,000 have been built and shipped by AM General, to the U.S. military services and 50 other countries. The U.S. Army and National Guard bought about 120,000 Humvees since 1983. Many of those are older models that will be replaced when they wear out, by a new series of combat vehicles. Humvees cost about \$220,000 each. There are seven new tactical vehicles being deployed today.

Over 18,500 JLTV's (Joint Light Tactical Vehicle) have been built and shipped to the U.S. Army by Oshkosh (they cost about \$340,000 each). In February, the contract was won by AM General, and the Army ordered another 20,682 vehicles at some price below \$340,000.<sup>36</sup> The plan is for the Army to buy 49,000 of these vehicles and the Marines will buy 9,000 (58,000 total). That number will rise as the Humvees remaining in service are retired.

The Army has purchased 300 ISV's (Infantry Squad Vehicle) from GM Defense. Only 177 have been transferred to infantry units for testing and evaluation and the remaining units (123) will be deployed to combat units later this year.<sup>37</sup> The Army plans to deploy a total of 649 vehicles by 2025. The ISV is built on the Chevy Colorado mid-sized pick-up truck chassis and costs about \$177,000 each.

In March, the first 20 AMPV's (Armored Multi-Purpose Vehicle) made by BAE Systems shipped to infantry units for testing and evaluation.<sup>38</sup> This vehicle will replace the old M113 APC (Armored Personnel Carrier). Over 80,000 M113's have been built since 1960. The present plan is to build and deploy about 2,800 AMPV's in the near future, at a cost of \$3.7 million each. About 450 old M113 APC's have been shipped to Ukraine by the U.S. and other countries.

General Dynamics Land Systems (GDLS) has been making the Stryker armored fighting vehicle since 2002, and 4900 have been built at a cost of about \$5 million each. As of March 2023, 90 of those Strykers went to Ukraine. Production ended in 2014, but many Strykers have been upgraded with new electronic and weapons packages.<sup>39</sup>

Next on the list is the Optionally Manned Fighting Vehicle (OMFV), to replace the M2 Bradley Fighting Vehicle. Since 1981, 4,641 Bradleys have been built by BAE Systems, at a cost of about \$2.2 million each. At this point, 5 companies have been awarded contracts to build OMFV prototypes in 2023.<sup>40</sup>

36 Sam Tricomo, "Army announces Joint Light Tactical Vehicle follow-on production award", U.S. Army, February 9, 2023, [https://www.army.mil/article/263884/army\\_announces\\_joint\\_light\\_tactical\\_vehicle\\_follow\\_on\\_production\\_award](https://www.army.mil/article/263884/army_announces_joint_light_tactical_vehicle_follow_on_production_award)

37 Ashley Roque, "US Army waves green flag for Infantry Squad Vehicle full-rate production", Breaking Defense, April 5, 2023, <https://breakingdefense.com/2023/04/us-army-waves-green-flag-for-infantry-squad-vehicle-full-rate-production/>

38 Ashley Roque, "AMPV full-rate production decision slated for this month, Army officials say", Breaking Defense, March 14, 2023, <https://breakingdefense.com/2023/03/ampv-full-rate-production-decision-slated-for-this-month-army-officials-say/>

39 Ashley Roque, "Slow your roll: Army plans reduced buys for some key combat vehicle fleets", Breaking Defense, March 22, 2023, <https://breakingdefense.com/2023/03/slow-your-roll-army-plans-reduced-buys-for-some-key-combat-vehicle-fleets/>

40 Sydney J Freedberg Jr, "OMFV race revs up: All 5 competitors bid to build Bradley replacement prototypes", Breaking Defense, November 22, 2022, <https://breakingdefense.com/2022/11/omfv-race-revs-up-all-5-competitors-bid-to-build-bradley-replacement-prototypes/>



Sometime later this year, GDLS will deliver the first Mobile Protected Firepower (MPF) light tank to the Army. It will weigh just 38 tons versus 73 tons for an M1 Abrams tank. The U.S. Army has ordered 96 MPFs at \$13.8 million each as the low-rate initial production price. The plan is to buy more than 504 MPF vehicles at lower prices in the future. Since 1980, about 10,400 M1 Abrams tanks have been produced at a price of about \$9 million each. 31 of those tanks have been shipped to Ukraine. The next step in the plan is called "Abrams-X". There is a 60-ton version of the Abrams tank in the design phase now.<sup>41</sup>

Then, there's the Robotic Combat Vehicle (RCV) program. Contracts were awarded in 2020 to Qinetiq for 4 RCV-L (the light-weight version weighing less than 10 tons) and to Textron for 4 RCV-Ms (the medium-weight version weighing between 10 and 20 tons). There is also an RCV-H (heavy version), weighing more than 20 tons but less than 30 tons, but no contracts have been issued for that variant. GDLS has also introduced their TRX 10-ton RCV-L prototype for this program, to replace some of the Stryker vehicles used for short-range air defense missions.<sup>42</sup>

Finally, about 200 ACV's (amphibious combat vehicle) have been delivered to the Marine Corp by BAE Systems. The Marines plan to buy about 400 of these vehicles at about \$1.6 million each. The ACV will replace the 877 AAV's (amphibious assault vehicle) made since 1972. One version, the ACV-C (command and control variant), has seven radios inside.<sup>43</sup>

If you add up all these numbers, we're probably looking at over 100,000 new ground combat vehicles being built and deployed over the next few years. And that does not include the potential purchases by our allies in Europe and the Pacific. Now, consider that each of those vehicles needs a communications package (RF, satellite, 5G) and a GPS system. Many will need EW (electronic warfare) packages. Some will need radar systems. Others will need SIGINT (Signals Intelligence) and ELINT (Electronic Intelligence) intercept packages. Most of them will need targeting and fire control computers for their onboard weapons. The defense electronics market is predicted to grow at 5.6% to \$289 billion by 2028, but I think the market might be larger and grow faster.<sup>44</sup>

So far, about 2,600 ground combat vehicles have been shipped to Ukraine by the U.S. and allies, along with about 230 tanks. After a year, it is clear that any war between Russia and surrounding states is going to be an air-ground war (using missiles, drones, tanks, and ground combat vehicles). Russia's air force and navy have been ineffective. Consequently, European states will build or buy thousands of ground combat vehicles and missiles in the near future. On the other hand, any war with China will be an air-sea war (using missiles, drones, ships, and submarines). Consequently, we will see Pacific nations buy more ships and missiles. For China to invade Taiwan, or any other island nation, they must move their troops and equipment by sea. Pacific nations will buy the weapons and platforms to hit China's ships before they ever reach the beach. These observations will begin to show up in the SIPRI report updates.

There's a general idea of what is happening in the military markets, from the ground combat vehicle perspective. We'll see additional trends when we study the other segments. Military spending is increasing worldwide, due to Russian aggression in Ukraine and China's inflammatory rhetoric about Taiwan. None of the nations, which donated weapons



Photo courtesy of General Dynamics: STRYKER IM-SHORAD (Initial Maneuver Short Range Air Defense)

41 Kris Osborn, "Army Analyzes Next-Generation Abrams Tanks for 2030 with the AbramsX", Warrior Maven, March 10, 2023, <https://warriormaven.com/land/army-next-generation-abrams-tanks-2030-abramsx>

42 Jared Keller, "This may be the Army's new missile-slinging battlebot of choice", Task & Purpose, March 30, 2023, <https://taskandpurpose.com/news/army-robotic-combat-vehicle-m-shorad-general-dynamics/>

43 Megan Eckstein, "Following deficiency, Marines add comms capability to ACV variant", Defense News, January 27, 2023, <https://www.defensenews.com/naval/2023/01/27/following-deficiency-marines-add-comms-capability-to-acv-variant/>

44 Lisa Diagle, "Defense electronics market to reach \$289 billion by 2028, study predicts", Military Embedded Systems, April 26, 2023, <https://militaryembedded.com/radar-ew/power-electronics/defense-electronics-market-to-reach-289-billion-by-2028-study-predicts>

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and platforms to Ukraine, expect to get them back. So, those vehicles need to be replaced with new ground combat vehicles that have more advanced technologies and capabilities.

As the world's automakers slowly collapse into a steaming pile of financial goo, under the strain of making unprofitable and ugly EVs, I suspect many of them will be pressed into service as military vehicle manufacturers by their governments. They need to offset the massive layoffs coming to the auto industry in every developed nation, and making gas and diesel-powered military vehicles would keep those workers employed and paying taxes. If that doesn't work, we could see certain countries nationalize their automakers and put them under government control. That might happen in Europe first if inflation persists and they go into a deep recession. European countries that don't have auto production facilities will need to buy their combat ground vehicles from those countries that do, creating a lucrative export market for any nationalized auto makers.

*"European countries that don't have auto production facilities will need to buy their combat ground vehicles from those countries that do, creating a lucrative export market for any nationalized auto makers."*

## Mergers and Acquisitions

As interest rates have risen and economic uncertainty has increased, the M&A segment has been stagnant. Additionally, the DoD has been cracking down on further consolidation in the military-aerospace markets. Back in 2022, the DoJ blocked Booz Allen Hamilton's acquisition of Everwatch (a supplier of cloud services and software to DoD). Also in 2022, the FTC blocked Lockheed's purchase of Aerojet Rocketdyne (a maker of rocket engines).

Through April, we have seen 18 banks lay-off employees in their investment banking divisions (that handle mergers and acquisitions). That is a further sign that M&A activity has slowed dramatically.<sup>45</sup>

There might be conversations going on with companies in our industry about M&A possibilities, but nothing has been announced recently.

## Summary

Financial conditions are uncertain as rising interest rates clobber anyone holding bonds, loans, or mortgages. More banks will fail. Money is more expensive, so that weighs heavily on any future M&A activity. Military spending is growing worldwide, but we could see a recession later this year and that could slow contracts and budgets going forward. Military budgets are in jeopardy as Congress decides on the debt limit.

The advances in AI algorithms have shown that all the money spent on the Metaverse was a serious misallocation of valuable financial and human resources.<sup>46</sup> Not since the overhyped telecom market forecasts for the board industry have we seen such a complete debacle. We may see the companies who believed the hype and over invested in the metaverse get into financial difficulty. In addition to stories, books, images, and poetry, AI is now generating music with sounds never before heard by humans.<sup>47</sup> However, AI is creating thousands of new jobs, but they pay \$15 per hour to tag and feed training data into the algorithms.<sup>48</sup>

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45 Buyside Hustle, "Complete List of Investment Banking Layoffs (2023)", <https://www.buysidehustle.com/complete-list-of-investment-banking-layoffs-2023/>

46 Ed Zitron, "RIP Metaverse", Business Insider, May 8, 2023, <https://www.businessinsider.com/metaverse-dead-obituary-facebook-mark-zuckerberg-tech-fad-ai-chatgpt-2023-5>

47 Brian Wang, "Artificial Intelligence for Music Production", Next Big Future, May 5, 2023, <https://www.nextbigfuture.com/2023/05/artificial-intelligence-for-music-production.html>

48 David Ingram, "ChatGPT is powered by these contractors making \$15 an hour", NBC News, May 6, 2023, <https://www.nbcnews.com/tech/innovation/openai-chatgpt-ai-jobs-contractors-talk-shadow-workforce-powers-rcna81892>

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The auto industry continues its decline into financial purgatory due to their unconstrained infatuation with electric vehicles, while the probability of earth being invaded by extraterrestrial aliens is greater than the effects of global warming. Even the Pentagon people say an alien mothership may have come through our solar system and launched a bunch of unmanned probes, to investigate our planet for energy and food resources for their xenomorphic masters. Meanwhile, our diets are changing; we must eliminate cows, pigs, chickens and anything that creates greenhouse gases and start eating bugs.

*“Meanwhile, our diets are changing; we must eliminate cows, pigs, chickens and anything that creates greenhouse gases and start eating bugs.”*

The biggest volume market in the military seems to be ground combat vehicles. The market for UAVs (unmanned aerial vehicles) might be a larger volume market, but most of those are small quadcopters or micro-airplanes. Several new reports will be coming out this summer, and that may give us a better understanding of the MIL markets.

The financial markets are on a cusp, a transition from one state to another. So are the auto industry and the military industry. So, sit down in front of your computer, munch on some cricket cookies, wash them down with some oat-milk, and ask one of the AI algorithms where we are going.

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