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Golden Dome Goes Autonomous: Why AI Must Fight America's Next Missile War in 90 Seconds or Not at All

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Introduction: The 90-Second Problem That Changes Everything

On March 6, 2026, Emil Michael — the Pentagon's Undersecretary of Defense for Research and Engineering and the Department's chief technology officer — gave the world its clearest window yet into why the U.S. military is willing to exile one of the world's most capable AI companies rather than accept ethical limits on autonomous weapons. Speaking on the All-In podcast, Michael described a scenario so operationally specific that it cuts through every abstraction in the AI ethics debate and lands squarely on the concrete reality facing American warfighters and planners:

"We need AI for things like Golden Dome. We have a Chinese hypersonic missile coming — we have 90 seconds to respond. A human anti-missile operator may not be able to discriminate with their own eyes what they're going after, but an autonomous counterattack would be a low risk because it's in space and you're just trying to hit something that's trying to get you."

Ninety seconds. That is the engagement timeline for a Chinese DF-27 ballistic missile launched from the Chinese mainland on a trajectory to strike Guam, Pearl Harbor, or a U.S. carrier operating in the Western Pacific. The DF-27 — now operationally deployed with a conventional warhead, confirmed in the December 2025 Pentagon report to Congress — has a range of 5,000 to 8,000 kilometers and maneuvers during reentry in ways that defeat traditional predictive intercept calculations. Its terminal velocity reaches Mach 10 to Mach 15. Its trajectory is non-parabolic, making it resistant to the engagement geometry assumptions built into every intercept algorithm developed for the SM-3 and THAAD systems.

Against that threat, in a 90-second engagement window, a human decision-maker is not just slow — they are structurally incapable of performing the sensor fusion, threat discrimination, and engagement geometry calculations required to execute a successful intercept. They would be reaching for their authorization card while the missile was already terminal.

This is the operational logic that drives Golden Dome. And it is why autonomous AI is not a future consideration for America's missile defense architecture — it is the present requirement.

I. Golden Dome: The $151 Billion Architecture of Autonomous Defense

President Trump's Golden Dome initiative — described by the administration as a comprehensive missile defense shield against ICBMs, hypersonic missiles, and drones of all sizes — is the single largest defense program in American history when measured by its potential contract ceiling. The Missile Defense Agency's SHIELD (Scalable Homeland Innovative Enterprise Layered Defense) multiple-award IDIQ contract vehicle carries a ceiling of $151 billion and runs through December 2035.

As of January 15, 2026, the MDA had approved 2,440 organizations to compete for SHIELD task orders — a number drawn from an original applicant pool of 2,463. The breadth of that awardee list is intentional. Golden Dome's architecture spans so many technical domains — space-based tracking, ground-based intercept, kinetic midcourse engagement, directed energy, battle management command and control, AI-enabled engagement sequencing, cyber resilience, and logistics — that no single prime contractor or even small consortium of primes

could address all of it. The SHIELD vehicle is designed for rapid delivery of innovative capabilities across the full spectrum of the architecture.

The capability architecture of Golden Dome, as revealed through contract awards, executive orders, and congressional testimony, encompasses three intercept layers:

Layer 1 — Boost-Phase Intercept: Destroying enemy missiles in the first minutes after launch, while they are still ascending on their boost-phase trajectory. This is the most effective intercept opportunity — the missile is moving slowest, its thermal signature is brightest, and its trajectory is most predictable. Space Force awarded competitive contracts for boost-phase interceptor development in November 2025 under a classified Other Transaction Authority arrangement.

Layer 2 — Kinetic Midcourse Intercept: Hit-to-kill interceptors engaging missiles during the coasting phase — the period between burnout and reentry. In December 2025, Space Force sought proposals for a space-based kinetic midcourse interceptor prototype designed to physically ram enemy missiles. Awards were expected in February 2026. Trump's executive order on space superiority mandates prototype demonstration of next-generation missile defense technologies by 2028.

Layer 3 — Terminal Defense: THAAD, Patriot, SM-3, and SM-6 systems engaging missiles in their terminal descent phase. This is the current primary intercept capability — and as the Iran conflict has brutally demonstrated, it is the most resource-intensive and inventory-depleting layer of the three.

The operational logic of Golden Dome is to push the intercept geometry earlier — to kill missiles in boost phase and midcourse before they ever reach the terminal engagement zone where expensive interceptors are consumed at rates that deplete strategic reserves in weeks. But achieving boost-phase and midcourse intercept at operationally relevant timescales requires autonomous AI engagement authorities. A human decision-maker in Washington, Colorado Springs, or Pearl Harbor cannot close the engagement geometry of a boost-phase intercept on a Chinese ICBM trajectory in time to authorize a shot. The authorization must be pre-delegated to an autonomous system operating under pre-approved rules of engagement.

This is not theoretical doctrine. It is already written into Golden Dome's conceptual architecture. It is why Emil Michael told the All-In podcast hosts that "someday it'll be real and we're starting to see earlier versions of that" — and why Anthropic's demand for human-in-the-loop requirements for lethal engagements was, from the Pentagon's perspective, not a safety measure but a mission-critical capability limitation.

II. The Iran Conflict as a Live Operational Test of AI Missile Defense Limitations

Operation Epic Fury, launched on March 1, 2026, has provided the most operationally significant live-fire test of U.S. missile defense capabilities since the Gulf War. The results are sobering — and they make the case for autonomous AI in missile defense more compellingly than any simulation, wargame, or think-tank analysis could.

The engagement environment during the opening days of Operation Epic Fury featured simultaneous attacks on U.S. forces and regional partners across Bahrain, Jordan, Kuwait, Iraq, Qatar, Saudi Arabia, and the United Arab Emirates. Iran launched thousands of Shahed-136

suicide drones and hundreds of ballistic missiles in coordinated salvos designed to saturate U.S. and allied air defenses. THAAD and Patriot batteries intercepted the incoming threats — but at a cost that has triggered emergency production reviews and a White House meeting with top defense industry executives.

The numbers tell the story. As of December 2025, the U.S. missile defense inventory stood at 534 THAAD interceptors and 414 SM-3 interceptors. During the earlier Twelve-Day War with Iran — a shorter, lower-intensity conflict — the U.S. used between 100 and 150 THAAD interceptors and 80 SM-3s in support of Israel. That single 12-day engagement consumed approximately 30% of the U.S. THAAD stockpile. Military analysts from CSIS have assessed that if the U.S. maintained the same interceptor expenditure rate in a sustained Operation Epic Fury, it would exhaust half of its entire interceptor inventory within four to five weeks.

Against those numbers, the 114-to-1 cost exchange ratio is the sharpest operational argument for AI-enabled, directed-energy, and low-cost autonomous intercept solutions. A single Iranian Shahed-136 drone costs approximately $35,000 to manufacture. A PAC-3 MSE interceptor costs approximately $4 million. Every time a THAAD or Patriot battery fires a kinetic interceptor against an inbound Shahed, the United States is spending 114 times as much as Iran spent to build the threat. At scale — with thousands of drones in a sustained campaign — this asymmetry is not just economically uncomfortable. It is strategically unsustainable.

III. AI as the Solution to the Cost-Exchange Problem

This is where AI stops being an abstract capability conversation and becomes a concrete operational imperative. The four most significant ways AI is already changing — and will continue to change — the economics of missile defense are: threat discrimination, engagement sequencing, directed energy integration, and autonomous low-cost counter-drone systems.

Threat Discrimination at Machine Speed: One of the most resource-intensive aspects of the current missile defense engagement chain is the human decision to commit an interceptor. Operators must assess whether an inbound contact is a real threat, a decoy, a neutral aircraft, or a friendly asset with a malfunctioning transponder. AI-enabled sensor fusion — integrating radar tracks, infrared signatures, acoustic signatures, and historical behavioral patterns — can perform threat discrimination at machine speed with greater accuracy than human operators working under time pressure. In the drone swarm environment created by Iran's Shahed campaigns, this discrimination capability directly reduces the number of interceptors wasted on false threats or low-priority targets.

Engagement Sequencing Optimization: In a multi-axis, multi-salvo engagement where dozens of threats are inbound simultaneously, the question of which threat to engage first, which to allow through to a secondary intercept layer, and which to deprioritize is a combinatorially complex optimization problem. Under current doctrine, engagement sequencing is performed by human operators working from battle management displays. AI engagement sequencing, operating at computational speeds that no human team can match, can optimize interceptor allocation across an entire salvo attack in milliseconds — maximizing the probability of kill across the full threat set while minimizing interceptor expenditure. This is not science fiction. Elements of AI-assisted engagement sequencing are already being tested within the existing THAAD and Patriot architecture.

Directed Energy: Unlimited Magazine Depth: The long-term answer to the 114-to-1 cost exchange problem is directed energy — high-energy lasers and high-power microwave systems that destroy drones and missiles using electricity rather than expendable interceptors. A directed energy system has virtually unlimited magazine depth as long as it has electrical power. It costs pennies per engagement rather than millions. Multiple directed energy programs are in development across the services — the Air Force's LCPD (Low-Cost Persistent DEW), the Army's IFPC Inc 2-I laser, and the Navy's HELIOS program. AI is the enabling technology for directed energy in a complex engagement environment: tracking multiple simultaneous targets, optimizing beam dwell time, compensating for atmospheric distortion, and sequencing engagements across a full threat salvo. Without AI, a directed energy system is a powerful weapon with a single operator and a single target. With AI, it becomes an autonomous defense node capable of defeating an entire drone swarm without a single kinetic expenditure.

Autonomous Low-Cost Counter-Drone Systems: The Air Force's Family of Affordable Mass Missiles (FAMM) and Lugged Affordable Cruise Missile (LACM) programs, the Army's Long-Range Kinetic Interceptor (LRKI) and AeroVironment Freedom Eagle contract, and the Navy's Multi-Mission Affordable Capacity Effector (MACE) program all represent the same operational insight: you defeat a $35,000 drone with a $5,000 AI-guided autonomous interceptor, not a $4 million kinetic missile. AI guidance and autonomous terminal engagement authority are the technology that makes these low-cost interceptors operationally viable. They cannot receive real-time human guidance at the engagement rates required. They must be autonomous.

IV. The Golden Dome AI Architecture: What's Being Built Right Now

Understanding what is actually under development in the Golden Dome program requires reading the signal architecture across multiple concurrent contract actions and program announcements.

The Space Development Agency's Tranche 3 tracking layer — a $3.5 billion investment awarded in late 2025 for 72 new satellites — establishes the persistent infrared and radar coverage needed to detect hypersonic launches with seconds of ignition. These satellites feed AI-enabled threat assessment systems that determine whether a detected launch constitutes a genuine attack requiring intercept authorization.

The Commercial Augmentation Space Reserve — transitioning to full-scale operations in 2026 with a target of 20 contracts by year-end — provides resilient commercial satellite communications bandwidth for battle management command and control during an active engagement. This is the communications backbone that enables autonomous engagement systems operating in space to receive updated engagement authority parameters and report battle damage assessment in real time.

The space-based kinetic midcourse interceptors currently in competitive development represent the most consequential autonomous weapons program in American history. These are not remotely piloted systems. They are satellites in low Earth orbit whose sole mission is to physically collide with enemy ballistic missiles during the midcourse flight phase. The engagement geometry, terminal maneuvering, and impact sequencing must be executed

autonomously — there is no communications pathway fast enough or reliable enough to support human-in-the-loop control at the closing velocities involved.

Trump's executive order on space superiority mandates prototype demonstration of these systems by 2028. The FY2027 budget request is expected to include significant additional funding for Golden Dome architecture development, with independent estimates placing the likely FY2027 Golden Dome appropriation at $8–$12 billion against the program's $175 billion total cost estimate.

V. The Doctrinal Crossroads: Pre-Delegation, Graduated Autonomy, and the 90-Second Standard

Emil Michael's 90-second scenario forces a doctrinal conversation that the national security community has been trying to avoid for a decade: under what circumstances, with what authorization architecture, should the United States pre-delegate lethal engagement authority to an autonomous AI system?

The answer is now being written in the operational requirements of Golden Dome. The framework that Michael described — graduated autonomy calibrated to operational risk, with higher-risk engagements requiring higher human authorization and lower-risk engagements (like a space-based interceptor engaging a detected ICBM) pre-delegated to autonomous systems — is a rational doctrinal structure. It is not the absence of human judgment. It is the pre-application of human judgment in the form of rules of engagement that the autonomous system executes in real time.

This framework has precedent in U.S. nuclear doctrine. The President's authority to authorize a nuclear launch can be pre-delegated under certain conditions to specified commanders. The nuclear authorization structure is not a failure of human judgment — it is the advance exercise of human judgment, codified into a decision tree that operates at machine speed when required. Golden Dome's autonomous engagement architecture is the conventional weapons equivalent of nuclear pre-delegation: carefully bounded, extensively modeled, and executed only when the engagement timeline precludes effective human decision-making.

Getting this architecture right — the pre-delegation boundaries, the rules of engagement parameters, the escalation thresholds, the battle damage assessment loops — is the most important national security engineering challenge of the next decade. And it requires warfighters, lawyers, AI engineers, and strategists working together from day one, not after the first autonomous engagement triggers a diplomatic or legal crisis.

VI. FY2027 Funding Signals for Golden Dome and Autonomous Missile Defense AI

For defense contractors, technology developers, and national security organizations tracking the FY2027 budget signals, the Golden Dome and autonomous missile defense AI landscape represents the single highest-signal procurement environment in current American defense spending.

Current FY2027 early-signal estimates (March 2026 intelligence):

- Golden Dome total program (SHIELD vehicle): $151 billion ceiling through 2035; FY2027 annual allocation estimated $8–$12 billion
- Space-based tracking layer (SDA Tranche 3 follow-on): $2.0–$3.5 billion
- Space-based kinetic interceptors (midcourse): $1.5–$2.5 billion in competitive prototyping
- Boost-phase interceptor development (classified OTA): $800 million–$1.5 billion (estimated)
- Battle management C2 AI (JADC2 integration): $1.8–$2.4 billion
- Directed energy programs (HELIOS, LCPD, IFPC): $1.2–$1.8 billion
- Low-cost autonomous interceptor programs (FAMM, LACM, LRKI, MACE): $2.5–$4.0 billion
- AI-enabled engagement optimization and threat discrimination: $800 million–$1.4 billion

Total addressable Golden Dome and autonomous missile defense AI signal for FY2027: $19–$29 billion.

The organizations that have been positioning in this space for the past 12 months — building SHIELD vehicle task-order relationships, developing AI threat discrimination capabilities, advancing directed energy prototypes, and establishing past performance in space-based sensor and intercept systems — are positioned to capture the first round of major task orders as FY2027 appropriations flow. The organizations that are reading this article and starting their positioning now are 12 months behind the leaders. That gap is closeable — but only through immediate, intelligence-driven action.

VII. The Strategic Imperative

Golden Dome is not just a missile defense program. It is the physical embodiment of America's answer to the most dangerous weapons technology China has fielded in a generation — the hypersonic anti-ship and anti-land-attack ballistic missile that can kill a carrier strike group or a Pacific base before any human defender can respond. The DF-27, the DF-17, the YJ-21 operating at Mach 10 in its terminal phase — these are weapons designed explicitly to defeat America's ability to defend Taiwan, to project power in the Pacific, and to deter Chinese aggression in the first island chain.

Golden Dome's autonomous AI is not a choice between human judgment and machine judgment. It is a choice between defending America and not defending America. When the engagement window is 90 seconds and the incoming missile is moving at Mach 15, the choice has already been made by the adversary's weapon. The only remaining question is whether the United States is fast enough to answer it.

AI makes the answer possible. The 90-second clock makes it mandatory.

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🔍 About the Author:

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