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Building the Golden Dome:

US Plans for a Missile Shield

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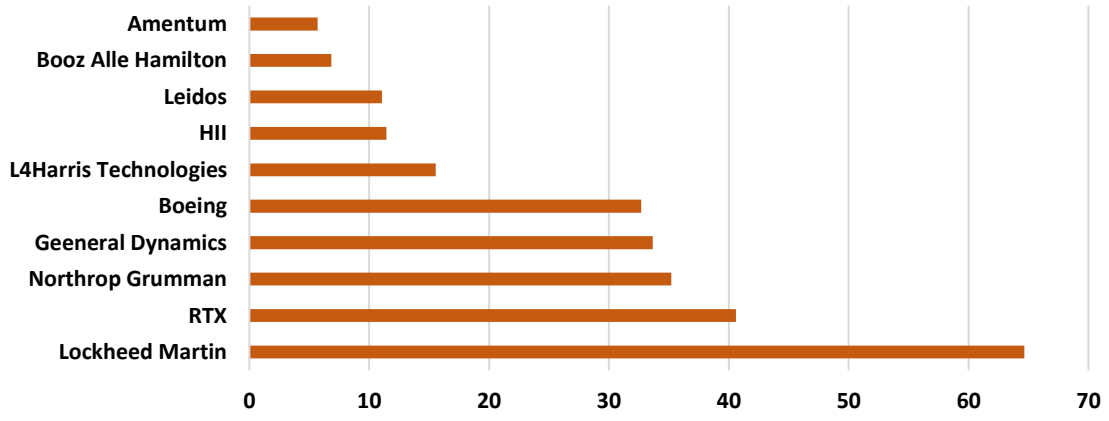
Executive Summary

- Trump proposed the Golden Dome as a national missile defense system modeled after Israel's Iron Dome, using AI, space-based lasers, and a satellite network; Canada is in talks to join the initiative
- A new long-range radar tested in Alaska successfully tracked a missile over 2,000 km, strengthening the U.S. interceptor systems in Alaska and California
- Golden Dome is designed to counter ICBMs, cruise missiles, hypersonic glide vehicles, and space-based weapons like FOBS, across all missile flight stages
- Boost-phase interception is technically ideal but extremely challenging due to the short time window after launch, requiring hundreds of satellites with long-range lasers or interceptors
- Midcourse interception is complicated by decoys in space and relies on systems like GMD and Aegis, whose success rates remain debated
- Terminal defenses like THAAD and Patriot PAC-3 provide last-resort protection but are limited in area coverage and vulnerable to missile swarms
- The entire system would be at risk from cyberattacks or anti-satellite missiles, which could create temporary gaps and compromise deterrence
- The U.S. landmass makes scaling Israel's Iron Dome model difficult; experts highlight the gap between defending a small country and a continent-sized target
- The project's estimated cost may reach $831 billion over two decades, with uncertainty about technological feasibility and implementation by 2029
- The initiative has triggered intense competition between defense giants (Lockheed, Northrop) and tech firms (SpaceX, Palantir, Microsoft), amid $150 billion in recent defense tech investments
- Critics fear Golden Dome could erode nuclear deterrence by threatening the balance of mutual destruction, prompting adversaries to escalate arms development
- The program may deepen the influence of the U.S. military-industrial complex, with ballooning defense budgets, off-the-books military aid, and rising national debt

Key Picture: Top 10 US Defence contracts (2024, defence revenue in billions dollar)



Source: Defence News

Introduction

Earlier this year, President Trump called on Congress to fund a "Golden Dome for America"—a nationwide missile defense system modeled after Israel's Iron Dome. The initiative aims to establish a vast satellite network—potentially numbering in the hundreds—to detect, track, and intercept missile threats, particularly from China and Russia. Trump described Golden Dome as a shield to "protect our homeland," and noted that Canada had expressed interest in joining the program. A statement from Canadian Prime Minister Mark Carney's office confirmed ongoing discussions with US officials on a broader security and economic partnership, including the strengthening of NORAD and participation in the Golden Dome initiative. The system would feature global real-time sensors, space-based interceptors—including "non-kinetic" lasers capable of neutralizing missiles within seconds of launch—and generative AI models to process and analyze vast, complex data sets.

The Pentagon successfully tested a new long-range radar in Alaska capable of detecting missile threats from Russia or China, potentially contributing to the Golden Dome missile defense system. Built by Lockheed Martin, the radar tracked a target over 2,000 km and enhances US interceptor systems in Alaska and California.

While Trump promises the Golden Dome will be operational by the end of his term in 2029, experts remain skeptical of the project's feasibility, cost, and strategic consequences.

Scope of the Threat: What Golden Dome Would Defend Against

Golden Dome is envisioned as a multi-layered system capable of intercepting a broad array of missile threats:

- ICBMs and ballistic missiles, which follow a three-stage flight: boost, midcourse, and terminal phases.
- Cruise missiles and hypersonic boost-glide vehicles, which travel at speeds over Mach 5 and follow unpredictable trajectories.
- Fractional Orbital Bombardment Systems (FOBS), which place warheads in space and command them to re-enter Earth's atmosphere to strike targets.

Such comprehensive protection would require interceptors and sensors capable of tracking and engaging missiles across all three flight phases—each with its own operational complexity.

Boost-Phase Interception

Intercepting missiles during their boost phase—immediately after launch—is considered ideal, as the missile is still intact, highly visible due to its heat signature, and has yet to release warheads or decoys. However, the window for interception is extremely short, lasting only a few minutes. To be effective, such a system would require hundreds, if not thousands, of low-Earth orbit satellites equipped with fast-reacting interceptors or advanced directed-energy weapons like lasers or particle beams. According to the American Physical Society, each satellite would need a strike range of over 800 kilometers to ensure sufficient coverage.

Midcourse and Terminal Phase Defenses

Intercepting missiles during the midcourse phase—when warheads travel through space—is particularly difficult. By this stage, the missile has separated from its booster and may deploy decoys, making it hard to distinguish real threats. Existing systems like the Ground-based Midcourse Defense (GMD) and the Navy's Aegis platforms are designed for this task, but their effectiveness remains questionable. Terminal-phase defenses, such as the Patriot PAC-3 and THAAD, act as the final shield once a warhead re-enters the atmosphere. While these systems can protect targeted areas, they are limited in coverage and could be easily overwhelmed by a large-scale missile barrage.

Vulnerabilities

Yet even if such a network were deployed, it would remain highly vulnerable. Adversaries could exploit its weaknesses by using ground-based anti-satellite missiles or launching cyberattacks to disable or disrupt critical systems. Any temporary breach could create a corridor for enemy missiles, casting doubt on the system's reliability in a real-world conflict.

From Iron Dome to Golden Dome

Israel's Iron Dome has intercepted thousands of short-range rockets since its deployment, proving its effectiveness in a compact geographic setting. However, adapting that model to the vast and complex terrain of the United States poses significant challenges. Jeffrey Lewis of the Middlebury Institute likens the leap from Iron Dome to Golden Dome to "the difference between a kayak and a battleship" with US beiing over 400 times larger The proposed US system would feature real-time global surveillance, space-based interceptors, non-kinetic lasers, and generative AI to analyze threats and guide responses.

Costs of Defence Missile System

Trump announced the project would cost $175 billion, but the Congressional Budget Office projects the final price tag could soar to $831 billion over the next 20 years.

As mentioned, Trump said he expects the system to be operational by the end of his term in January 2029. However, experts remain skeptical about the timeline and cost. Tom Karako of the Center for Strategic and International Studies pointed out that while the $175 billion figure is a new benchmark, it likely spans a decade or more. He also emphasized the potential of US tech firms to accelerate progress by integrating Silicon Valley innovations with existing missile defense systems.

Strategic Parallels with Reagan's SDI

The Golden Dome echoes President Ronald Reagan's 1980s "Star Wars" missile shield concept, which was shelved due to technological limitations at the time.

Calls for missile defense systems have intensified since the first aerial attacks on civilians, with governments seeking ways to protect populations and infrastructure from enemy strikes. Early efforts, such as Britain's air defenses in WWI and WWII, evolved into more ambitious plans during the Cold War—most notably Ronald Reagan's 1983 Strategic Defense Initiative (SDI), dubbed "Star Wars." While the Golden Dome echoes Reagan's 1980s "Star Wars" missile shield concept, which was shelved due to technological limitations at the time.

SDI envisioned a vast, space- and land-based missile shield capable of neutralizing nuclear warheads before reentry, effectively making them obsolete. While presented as a path to peace, the initiative alarmed the Soviet Union, which feared it would eliminate the deterrent effect of mutually assured destruction and shift the strategic balance in Washington's favor. Critics also noted the plan's immense cost, technological uncertainties, and the political risk of diverting funds from domestic programs.

Though SDI never materialized, it underscored the geopolitical risks and technical challenges of missile defense. Today, similar concerns surround President Trump's proposed "Golden Dome" system. While it promises nationwide protection, it faces questions over cost, feasibility, untested technologies, and the potential to destabilize global security rather than enhance it.

Silicon Valley vs Defense Industry Race

The Golden Dome project has triggered fierce competition between Silicon Valley and traditional defense giants. The Pentagon has encouraged "non-traditional" contractors to participate, inviting bids from companies like SpaceX, Palantir, Microsoft, Anduril, and C3 AI. Since 2021, over $150 billion has flowed into defense tech start-ups, fueled by wars in Ukraine and the Middle East and growing US-China tensions.

Despite this influx, legacy contractors like Lockheed Martin and Northrop Grumman still dominate. Lockheed emphasizes its proven missile defense systems (THAAD, PAC-3), satellite integration, and ability to manage complex system-of-systems challenges. Northrop executives describe Golden Dome as a "transformational" opportunity and tout their experience with missile tracking and space-based interceptors.

Contracting and Integration Challenges

The Missile Defense Agency plans to award $151 billion in contracts over 10 years through an open competition. While companies like SpaceX ($12.4B in contracts) and Palantir ($3.6B in contracts + $50B in subcontracts) have a foothold, newer entrants—such as Anduril, C3 AI, ScaleAI, and ShieldAI—have gained traction, many now valued over $1 billion. Mike Brown, former head of the Pentagon's Defense Innovation Unit, said the government is "turbocharging" how it adopts commercial tech. Big tech firms like Microsoft, Google, and OpenAI have also expanded their cloud and AI offerings for defense.

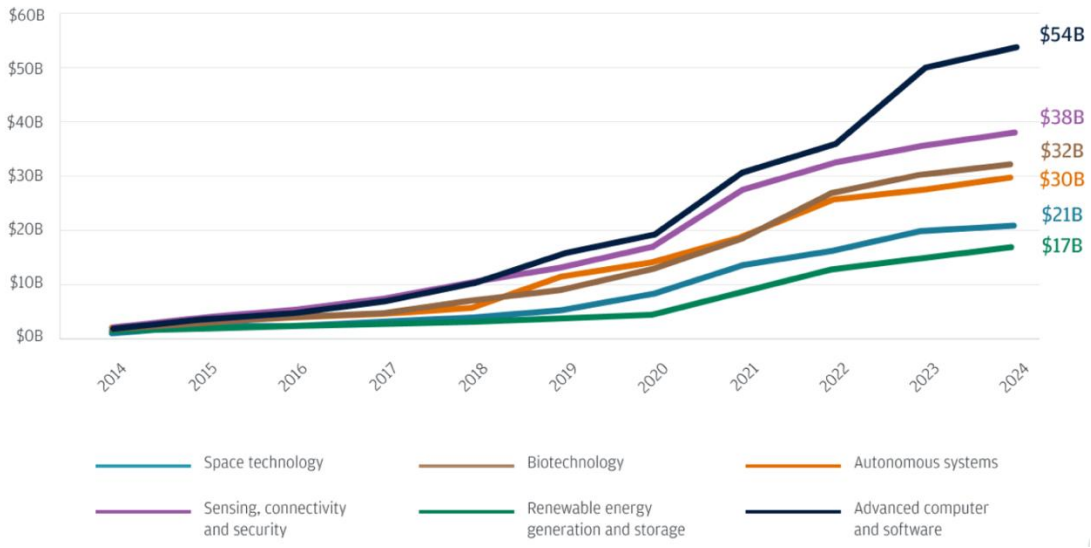
Strategic Risks and Global Fallout

Nearly two generations ago, Reagan's Strategic Defense Initiative (SDI) was ultimately abandoned after widespread criticism. Rather than enhancing security, Golden Dome risks triggering a destabilizing nuclear arms race and increasing the likelihood of accidental conflict. As with SDI, opponents warn the project is driven more by politics and industry interests than by sound strategy—and should be abandoned before it deepens global instability.

A key concern is that Golden Dome could undermine the principle of mutually assured destruction (MAD), which has served as a cornerstone of global nuclear deterrence. By seeking to make the US missile-proof, the system could be interpreted by adversaries as an attempt to secure a first-strike advantage, prompting rivals like China and Russia to expand their offensive capabilities. Both have already condemned the project as destabilizing, warning it could provoke a new arms race—particularly in space, where regulation remains minimal.

Critics also argue the initiative would further entrench the already sprawling US military-industrial complex. The true scale of military spending is far larger than reported, as it includes not only direct arms purchases but also foreign military aid that indirectly supports US defense firms. This persistent overspending is a major driver of the national deficit and rising government debt, raising questions about the domestic cost of strategic overreach.

Figure 1: Cumulative Invested Capital (from 2014) for Select US Defense Tech Categories



Source: JP Morgan