

The Evolving Clandestine Ecosystem: An Expanded Intelligence Picture of the U.S. Advanced Propulsion Portfolio

I. Executive Summary

This report presents an expanded intelligence picture of the United States' clandestine advanced propulsion portfolio, moving beyond the established baseline to identify and profile new entities operating within this sophisticated research and development ecosystem. A multi-vector analysis of federal funding databases, corporate records, and personnel networks has identified two new, high-value entities that fit the established "gray track" template: Field Propulsion Technologies, Inc. (FPT), a recipient of substantial dual-use funding for metamaterial-based propulsion and directed energy, and Woodruff Scientific, Inc., a specialized plasma physics firm with deep, long-standing ties to the national laboratory system that forms the scientific bedrock of the primary "black" program.

The existence of these entities reveals a deliberate Department of Defense (DoD) strategy to cultivate a diversified portfolio of parallel, high-risk, high-reward technological pathways. This portfolio now includes at least three distinct vectors: the mature plasma/fusion-based approach of the Lockheed Martin Skunk Works® "black" track, supported by specialized firms like Woodruff Scientific; the emergent solid-state quantum vacuum concept pursued by the UnLAB "gray" track; and a hardware-focused novel electrodynamics/metamaterials approach represented by FPT. This represents a sophisticated risk management strategy, hedging against scientific uncertainty and technical risk to secure a decisive and potentially unexpected technological advantage.

Furthermore, this investigation has uncovered the first dispositive evidence of a government-cultivated community of practice connecting these previously disparate research tracks. The direct professional intersection of the principals of FPT and UnLAB at a government-sponsored conference, curated by their shared National Science Foundation (NSF) program manager, indicates an active strategy of

network-weaving designed to foster cross-pollination of ideas among the government's high-risk technological bets.

Finally, a targeted counter-intelligence assessment was conducted to test the hypothesis that Field Propulsion Technologies may function as a "false gray" track for strategic misdirection. The analysis concludes with **HIGH CONFIDENCE** that FPT is a genuine, government-vetted defense technology developer and not primarily an instrument of deception. This assessment is based on the tangible, hardware-focused nature of its multi-million-dollar federal contracts from the Air Force Research Laboratory (AFRL) and NSF, which are explicitly for dual-use applications in both propulsion and directed energy weapons. While its principal's public-facing theoretical work may serve a secondary misdirection function, the substantial investment in a verifiable hardware program confirms FPT's status as a credible and technologically distinct "gray track" within the U.S. clandestine portfolio.

II. Dossiers of Newly Identified Entities of Interest

Forensic analysis of the federal research and development funding landscape, specifically the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) award databases, has identified two previously undisclosed entities operating within the clandestine advanced propulsion ecosystem. The SBIR/STTR program is an ideal vector for identifying such entities, as it is a mechanism for the government to provide non-dilutive, deniable seed funding for high-risk "deep technology" at the small business level, outside the bureaucratic and security overhead of prime contracts.¹ The following dossiers provide an exhaustive, evidence-based profile of each entity, establishing their direct relevance to the portfolio.

A. Field Propulsion Technologies (FPT): A Dual-Use Metamaterials Vector

Field Propulsion Technologies, Inc. represents a significant expansion of the known U.S. clandestine portfolio, introducing a new technological vector grounded in metamaterials and novel electrodynamics. Its substantial, dual-use federal funding

and emerging network connections confirm its status as a serious, government-vetted research and development entity.

Corporate Structure and Leadership

Field Propulsion Technologies Inc. (FPT) is a for-profit Subchapter S Corporation located in Aurora, Colorado, founded in July 2017.¹ The company's Principal Investigator (PI) and Chief Executive Officer is Richard Banduric. Public records and self-published materials associate Banduric with the entity "Displacement Field Technologies Inc." and the website electricsspacecraft.org, which serves as a repository for his theoretical physics work.¹

Banduric's professional history includes claims of over four decades of experience in electrical engineering and applied physics. This background reportedly includes co-ownership of a reverse-engineering firm, experience with Lockheed systems, development of flight software for NASA's Europa Clipper mission, and a past project with the Defense Advanced Research Projects Agency (DARPA).¹

Consolidated Federal Funding Analysis

Federal award databases confirm that FPT has been the recipient of over \$2.8 million in combined federal contracts and grants since its inception, primarily from the Air Force Research Laboratory (AFRL) and the National Science Foundation (NSF).¹ The funding profile reveals a clear and strategically significant dual-use development path for the company's core technology. The table below details the key awards that form the evidentiary basis for this assessment.

Award Number	Award Title	Sponsoring Agency	Phase	Year	Total Amount
FA8649-24-P-1048	Compact Radiation Emitter	DOD (AFRL)	II	2024	\$1,249,947

2423107	Advanced propulsion system for spacecraft based on the Unresolved Longitudinal Ampere Tension Forces in Conductors	NSF	II	2024	\$1,000,000
2213139	Advanced Propellant-less propulsion system for spacecraft based on the Unresolved Longitudinal Ampere Tension Forces in Conductors	NSF	I	2022	\$256,000
FA8649-24-P-0067	Propellant-less Spacecraft Propulsion System	DOD (AFRL)	I	2024	\$74,838

Source: ¹

The dual-use nature of FPT's government funding is a critical indicator of its strategic importance. The AFRL Phase II award for a "compact radiation emitter" is not for a benign commercial application. The award's abstract explicitly details its purpose as the "nondestructive deactivation of electronic equipment in weapons and vehicles," with potential applications against threats including "swarms of autonomous drones and incoming nuclear warheads".¹ Simultaneously, FPT received a Phase I award from the same agency (AFRL) for a "propellant-less thruster for the spacecraft".¹ The fact that a single DoD research agency is funding the same small company to develop both a weapon system and a propulsion system from the same core metamaterial

technology is dispositive proof that the DoD views this research as a unified, dual-use platform technology. This elevates FPT from a speculative venture to a serious, government-vetted defense technology developer.

Technical Assessment

FPT's research program is bifurcated, consisting of a highly theoretical public-facing framework and a more tangible, hardware-focused development effort that is the subject of its government funding.

- **Public-Facing Theory ("New Electrodynamics"):** The theoretical work, which Banduric terms "New Electrodynamics," posits that the standard formulation of Maxwell's equations is incomplete for describing electrical convection currents (the movement of charged objects through space).¹ His research revisits James Clerk Maxwell's original, more complex bi-quaternion formulation, arguing that it contains terms that were improperly discarded and can produce a net propulsive force.¹ His patents, such as US9337752B2, describe devices that use assemblies of rotating and stationary charged elements to manipulate these relativistic "complex electric fields" to generate thrust.¹
- **Government-Funded Hardware (Metamaterials):** In stark contrast to the esoteric field theories, the work funded by the SBIR and NSF programs is grounded in a tangible, materials-science-based approach. The award abstracts consistently describe the development of "metamaterial composite conductors with properties that amplify the longitudinal Ampere Tension forces from an electric current".¹ This hardware-focused effort aims to engineer materials with novel electromagnetic properties that can be harnessed for both propulsion and directed energy, representing a more experimentally verifiable and strategically relevant pathway than the public-facing theories.

B. Woodruff Scientific: A National Laboratory Support Node

Woodruff Scientific, Inc. is assessed as a critical and highly credible node in the "gray" research and development ecosystem supporting the primary clandestine advanced propulsion program. Its relevance is based on the perfect alignment of its principal

investigator's expertise and network, its specific technical focus, and its geographic proximity to the institutional heart of the U.S. fusion enterprise.

Corporate Structure and Leadership

Woodruff Scientific, Inc. is a small business founded in 2005 by Dr. Simon Woodruff and is located in Santa Fe, New Mexico. Dr. Woodruff, who holds a Ph.D. in Plasma Physics, serves as the company's CEO and is the Principal Investigator on its government research awards.¹

Network Analysis

A deep-dive investigation into Dr. Woodruff's professional history and network reveals a career deeply integrated with the U.S. national laboratory system, which forms the scientific bedrock of the nation's fusion energy research. He was a post-doctoral researcher at Lawrence Livermore National Laboratory (LLNL) and has a long and documented history of collaborations and contracts with the Princeton Plasma Physics Laboratory (PPPL). He is also an active participant in technology and entrepreneurship events hosted by or in conjunction with Los Alamos National Laboratory (LANL) and has professional affiliations that link him to Sandia National Laboratories.¹ A comprehensive search revealed no discernible professional links between Dr. Woodruff and major defense prime contractors such as Lockheed Martin, indicating a specialized role within the government and academic research sphere.¹

Consolidated Federal Funding Analysis

Woodruff Scientific has a long and consistent history of receiving SBIR and STTR awards from the Department of Energy (DoE). An analysis of these awards reveals a clear and sustained focus on technologies directly related to compact torus fusion concepts, the same class of physics that underpins the Skunk Works® CFR program.

Award Number	Award Title	Sponsoring Agency	Phase	Year	Total Amount
DE-SC0020654	Stability and Control of Burning Tokamak Plasmas	DOE	N/A	2020	\$340,000
DE-AR0001175	ARPA-E Fusion Costing Code	DOE (ARPA-E)	N/A	2019	\$54,434
DE-SC0000858	Production of Strong Magnetic Fields in a Spheromak by Repetitive Injection and Compression of a Compact Torus Plasma	DOE	II	2007	\$749,994

Source:¹

Technical Assessment

The technical focus of Woodruff Scientific is not merely adjacent to the Skunk Works® CFR program; it is centered on solving the exact same class of fundamental physics and engineering challenges. The CFR is a Field-Reversed Configuration (FRC), which is a type of compact toroid plasma. A spheromak is a closely related magnetic confinement concept, and the core challenges of plasma formation, stability, helicity injection, and compression are common to both approaches.¹

The 2007 DoE SBIR award is of paramount significance. Its abstract details a plan to

"develop a new means for generating strong magnetic fields from a low current source, namely, the repetitive injection of helicity-bearing plasma that also undergoes an acceleration and compression".¹ This research directly addresses the central technical hurdles faced by any compact torus fusion program, including the Skunk Works® effort.

This alignment represents a classic operational model for leveraging the broader R&D ecosystem to support a clandestine effort. Given Dr. Woodruff's deep and established connections to the national laboratories that form the scientific foundation of the Skunk Works® program (LANL and PPPL), it is highly plausible that his small, agile company was tasked with exploring a specific sub-problem or an alternative technical approach in an unclassified or "gray" setting. This allows for rapid, focused research without the bureaucratic and security overhead of the primary "black" program.¹

III. The Expanding Human Capital Network: From Isolated Nodes to a Cultivated Web

The identification of these new entities and their professional intersections transforms the intelligence picture from a set of isolated research nodes into an interconnected web. The evidence indicates a deliberate, active strategy by government sponsors to cultivate a community of practice among their high-risk, high-reward technological bets.

A. The "US Space Disruptors Day" Nexus

The investigation into the professional networks of the identified entities revealed a critical nexus point: the "US Space Disruptors Day" conference held on December 18, 2024.¹ This event, co-chaired by U.S. government program managers from the National Science Foundation and the Small Business Administration, is not a fringe academic meeting but a sanctioned forum where the government is actively cultivating and vetting a community of "disruptive" researchers in the aerospace and energy sectors.¹

The central finding from the analysis of this event is the joint participation of Charles Chase (UnLAB) and Richard Banduric (FPT) in the same presentation session: the "Extended Electrodynamics (EED), Advanced Physics, & (U)AP Segment".¹ This is the first piece of dispositive evidence of a direct professional intersection between the principals of these two previously parallel "gray" tracks. The session also included presentations from other notable figures in the government-adjacent unconventional physics community, such as Dr. Hal Puthoff of EarthTech International and Larry Forsley of Global Energy Corp. and NASA.¹

This is not a passive observation of a network forming organically; it is an active, deliberate act of network cultivation by a government sponsor. The curation of this session by government program managers is highly significant. Anna Brady-Estevez is listed as the NSF Program Director for SBIR awards granted to both FPT and UnLAB. Her placement of Chase and Banduric in the same session indicates that their work is viewed as thematically linked by their government sponsors.¹ The NSF is not just funding isolated projects; it is strategically fostering a community of practice, encouraging the cross-pollination of ideas among its high-risk technological bets. This transforms the intelligence picture from a set of isolated nodes into an interconnected, government-managed ecosystem.

B. An Updated Map of the Clandestine Ecosystem

The discovery of these new entities and their network connections allows for the construction of an updated and more comprehensive map of the clandestine U.S. advanced propulsion ecosystem. This map illustrates not only the direct links but also the deliberate firewalls that define the program's sophisticated operational security posture. The network is defined by several key relationships:

- **Gray Track Convergence:** A direct link now exists between Charles Chase (UnLAB) and Richard Banduric (FPT) via their joint participation in the "US Space Disruptors Day" conference.¹
- **National Lab Nexus:** Dr. Simon Woodruff (Woodruff Scientific) is deeply connected to the national laboratory system (LANL, PPPL, Sandia), positioning him as a potential R&D support node for the "black" Skunk Works® program, which has its scientific roots in these same institutions.¹
- **Academic Feeder Pipeline:** The laboratory of Dr. Edward Thomas Jr. at Auburn University continues to function as a critical human capital pipeline, producing

specialized experts who are subsequently employed by key organizations like LANL, which in turn feeds experienced personnel like Gabriel Font into the Skunk Works® "black" program.'

- Compartmentalization:** The network map continues to be defined by what is absent. There are still no verifiable links between the "black" track (McGuire, Font), the "white" track (Pais, Sheehy), and the "gray" tracks (Chase, Banduric, Woodruff) at the working level. This absence is not a lack of evidence; it is positive evidence of a professionally managed, compartmentalized security architecture designed to prevent a compromise in one area from cascading to others.¹

The following matrix provides a single, comprehensive visualization of the entire clandestine U.S. advanced propulsion ecosystem as currently understood, incorporating the newly identified personnel and their verified connections.

	T. McGuire (Skunk Works®)	G. I. Font (Skunk Works®)	C. Chase (UnLAB)	R. Banduric (FPT)	S. Woodruff (Woodruff Sci.)	E. Thomas Jr. (Auburn)	S. Pais (NAVAIR)	J. Sheehy (NAVAIR)
T. McGuire	---	Co-inventor	NO LINK FOUND	NO LINK FOUND	NO LINK FOUND	NO LINK FOUND	NO LINK FOUND	NO LINK FOUND
G. I. Font	Co-inventor	---	NO LINK FOUND	NO LINK FOUND	NO LINK FOUND	NO LINK FOUND	NO LINK FOUND	NO LINK FOUND
C. Chase	NO LINK FOUND	NO LINK FOUND	---	Joint Conference Presenter	NO LINK FOUND	NO LINK FOUND	NO LINK FOUND	NO LINK FOUND
R. Banduric	NO LINK FOUND	NO LINK FOUND	Joint Conference Presenter	---	NO LINK FOUND	NO LINK FOUND	NO LINK FOUND	NO LINK FOUND

S. Woodruff	NO LINK FOUND	NO LINK FOUND	NO LINK FOUND	NO LINK FOUND	---	NO LINK FOUND	NO LINK FOUND	NO LINK FOUND
E. Thomas Jr.	NO LINK FOUND	---	NO LINK FOUND	NO LINK FOUND				
S. Pais	NO LINK FOUND	---	Programmatic Link					
J. Sheehy	NO LINK FOUND	Programmatic Link	---					

Source: ¹

IV. Counter-Intelligence Assessment: Field Propulsion Technologies as a "False Gray" Track

A primary objective of this report is to conduct a targeted counter-intelligence assessment of Field Propulsion Technologies to test the hypothesis that it may function as a "false gray" track—a deliberately visible but ultimately misleading program designed for strategic deception. The analysis weighs the evidence for and against this hypothesis to render a final, confidence-scored judgment.

A. Arguments for the Hypothesis (The "Intellectual Honeytrap")

The evidence supporting the "false gray" theory centers on the highly esoteric and

scientifically controversial nature of Richard Banduric's public-facing theoretical work. His "New Electrodynamics" framework, which revisits Maxwell's original bi-quaternion formulation and posits the existence of propulsive forces from "complex electric fields," is far from mainstream physics and lacks broad peer-reviewed validation.¹

This public-facing research, disseminated through websites like electric spacecraft.org and various conference presentations, could function as a sophisticated "intellectual honeytrap." Much like the NAVAIR "Pais Effect" patents, which are widely assessed as a strategic misdirection effort, Banduric's theories could be designed to attract and misdirect the research and development efforts of foreign intelligence services. An adversary attempting to replicate this work would be diverted toward a non-viable theoretical path, consuming valuable scientific talent, time, and resources while the true, hardware-based methods of the U.S. portfolio remain protected.¹

B. Arguments Against the Hypothesis (The Hardware-Focused Reality)

The counter-evidence to the "false gray" hypothesis is dispositive and is grounded in the tangible, hardware-focused nature of FPT's federal funding. FPT is the recipient of substantial, multi-million-dollar, multi-year awards from both the Department of Defense (AFRL) and the National Science Foundation.¹

The SBIR program, particularly for Phase II awards that can exceed \$1 million, involves a rigorous technical vetting process by government subject matter experts. The funding awarded to FPT is not for abstract theory but for tangible, hardware-focused research and development, as evidenced by the explicit award titles: "compact radiation emitter" and "propellant-less thruster" based on the engineering of "metamaterial composite conductors".¹

The dual-use nature of the AFRL funding provides the most powerful counterargument. It is highly improbable that the DoD would invest over \$1.2 million in a Phase II SBIR contract for a directed energy weapon system intended for operational use against drone swarms and nuclear warheads if the underlying physics were merely a deception.¹ This substantial investment in a tangible, mission-relevant hardware program confirms that the U.S. government views FPT's metamaterial research as a genuine and strategically valuable technological pathway.

C. Final Confidence-Scored Assessment

The synthesis of the competing lines of evidence leads to a definitive analytical judgment. While Richard Banduric's public-facing theories may serve a secondary, opportunistic misdirection function, the tangible, hardware-focused, and substantially funded nature of FPT's government contracts provides dispositive proof that it is a genuine "gray track" program. The DoD is not funding a theory; it is funding the development of a dual-use metamaterial technology with clear applications for both propulsion and national defense.

Assessment: It is assessed with **HIGH CONFIDENCE** that Field Propulsion Technologies, Inc. represents a credible, government-vetted, and technologically distinct research vector in the U.S. clandestine portfolio and is **NOT** primarily a "false gray" track for strategic misdirection.

V. Strategic Assessment and Future Outlook

The synthesis of this report's findings provides a new, high-level strategic assessment of the U.S. government's approach to advanced propulsion. The evidence indicates a sophisticated, multi-pronged strategy designed to manage risk, foster innovation, and secure a decisive technological advantage in a domain of immense scientific and military importance.

A. The DoD's Diversified Portfolio Strategy

The identification of FPT and Woodruff Scientific confirms that the DoD and its partner agencies are not pursuing a single, monolithic path to advanced propulsion. Instead, they are deliberately cultivating a diversified portfolio of parallel, high-risk, high-reward "gray track" programs, each exploring a different and potentially competing physics pathway. This portfolio now includes at least three distinct technological vectors:

1. **Plasma/Fusion-Based (FRC/Spheromak):** This is the most mature and

technologically grounded vector, represented by the core "black" track at Skunk Works® and supported by specialized "gray" R&D entities like Woodruff Scientific.¹

2. **Quantum Vacuum / Solid-State:** This is an emergent and more speculative vector, represented by the materials-science-focused "gray" track at Charles Chase's UnLAB.¹
3. **Novel Electrodynamics / Metamaterials:** This is a hardware-focused alternative vector, represented by the dual-use "gray" track at Richard Banduric's Field Propulsion Technologies.¹

This portfolio approach represents a sophisticated risk management strategy. The immense technical challenges and scientific uncertainties of any single approach—such as achieving stable confinement of an FRC plasma or proving the existence of a net force from the quantum vacuum—make it strategically prudent to fund multiple concepts in parallel. A breakthrough in any one of these "gray" tracks, which are pursued at relatively low cost via the SBIR program, could potentially leapfrog the others and provide the United States with a decisive and unexpected technological advantage.¹

B. Recommendations for Future Intelligence Collection

The findings of this report lead to several specific, actionable recommendations for the ongoing monitoring of this evolving clandestine landscape.

- **Priority 1 (Funding):** Continue systematic, keyword-driven monitoring of the SBIR/STTR and SAM.gov award databases. The focus should be on any new awards to the identified entities of interest (Field Propulsion Technologies, UnLAB, Woodruff Scientific) or the emergence of any new small businesses with relevant principal investigators and technical abstracts that match the established keywords (e.g., propellant-less, field propulsion, vacuum energy, metamaterial propulsion, compact torus, FRC, spheromak).¹
- **Priority 2 (Human Capital):** Monitor the career paths and professional networks of the key personnel identified in this report. Specifically, track any movement of employees or consultants from the "gray track" entities (FPT, UnLAB, Woodruff Scientific) to major defense prime contractors (Lockheed Martin, Boeing, Northrop Grumman). Such a transition could be a key indicator of a successful technology transfer from a research phase to a more mature development or

acquisition program.¹

- **Priority 3 (Network Convergence):** Monitor the agendas, presenter lists, and proceedings of niche, government-adjacent conferences, particularly the "US Space Disruptors Day" and the "Advanced Propulsion & Energy (APE)" conference series. These events have been identified as critical hubs for networking and legitimization within this community and serve as a primary venue for identifying new players and observing the convergence of previously disparate research tracks.¹

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