INTELLIGENCE ASSESSMENT: An Analysis of the Global Advanced Propulsion Technology Landscape and Associated Clandestine Networks

Part I: New Lead Intelligence Report: Field Propulsion Technologies Inc.

Section 1.1: Subject Dossier: Richard Banduric

The individual "rbanduric," associated with the email address rbanduric@fieldpropulsiontechnologies.com, is definitively identified as Richard Banduric, the Principal Investigator and CEO of Field Propulsion Technologies Inc.. Further associations link him to the entity Displacement Field Technologies Inc. and the email address rbanduric@electricspacecraft.org.

Banduric's professional work is centered on the development of propellant-less propulsion systems derived from a theoretical framework he has termed "New Electrodynamics". This framework posits that the currently accepted formulation of Maxwell's equations, while effective for describing electrical conduction currents (charge flow within a conductor), is incomplete and fails to accurately describe electrical convection currents (the movement of charged objects through space). His research revisits James Clerk Maxwell's original, more complex bi-quaternion formulation, which he argues contains terms that were improperly discarded during Oliver Heaviside's reformulation. From this, Banduric derives a "complex electric field" and a "Scalar Electric Potential," asserting that the interaction between these relativistic fields, amplified by specific geometries, can produce a net propulsive force without the expulsion of mass.

This theoretical work is substantiated by a portfolio of U.S. patents for devices designed to "effect motion" through these principles. Key patents include US 9,337,752 ("Interacting complex electric fields and static electric fields to effect motion"), US 10,320,312, and US 10,084,395. The patented systems describe assemblies of rotating and stationary charged elements, often with specialized coatings and geometries, engineered to manipulate and amplify relativistic electric field effects to generate thrust. An early, withdrawn European patent from 1990 (EP0436405A1) for an "Electromagnetic energy propulsion engine" that expels magnetic field pulses suggests a long-standing and consistent research interest in this domain.

Section 1.2: Corporate Forensics: Field Propulsion Technologies Inc. (FPT)

Field Propulsion Technologies Inc. (FPT) is a registered Subchapter S Corporation and small business located in Aurora, Colorado. The company is registered in the System for Award Management (SAM.gov) and is listed as a Department of Defense (DoD) vendor, having

secured contracts exceeding $25,000.
FPT's stated technical focus is the development of propellant-less propulsion systems based on novel metamaterials. The company claims to have engineered "metamaterial composite conductors with properties that amplify the longitudinal Ampere Tension forces from an electric current," a phenomenon they assert can be harnessed to produce thrust.
This research has attracted significant funding from the DoD through the Small Business Innovation Research (SBIR) program, revealing a dual-use application of its core technology.

- A 2024 Phase II SBIR award (Contract: FA8649-24-P-1048) for $1,249,947 is for the development of a "compact radiation emitter." This device uses FPT's metamaterial technology for the "nondestructive deactivation of electronic equipment in weapons and vehicles". The abstract explicitly states its potential application as a directed energy weapon against threats including swarms of autonomous drones, incoming nuclear warheads, and as a defense against Electromagnetic Pulse (EMP) attacks.
- A separate 2024 SBIR award (Contract: FA8649-24-P-0067) is for a "propellant-less thruster for the spacecraft," based on the same underlying metamaterial technology.
- An earlier Phase I SBIR award (197515) supported the initial research into the conditions under which Ampere Tension forces could be exploited for both propulsion and advanced energy storage applications.

Section 1.3: Network Linkage and Relevance Assessment

A direct, verifiable professional link has been established between Richard Banduric and Charles Chase, the principal of the UnLAB "gray" track. Both individuals were featured presenters at the "US Space Disruptors Day" conference on December 18, 2024. During this event, Banduric, representing FPT, presented in the "Extended Electrodynamics, UAP tech" session, a forum that also included figures such as Dr. Hal Puthoff. Charles Chase, representing UnLAB, also presented at the same conference. This shared venue indicates that the work of both FPT and UnLAB is now considered relevant within the same high-level, specialized strategic community focused on disruptive aerospace technologies. Public reporting has also begun to associate Banduric with the defense establishment, with one podcast referring to claims made by a "Lockheed/NASA engineer Richard Banduric" regarding recovered materials.
The emergence of FPT as a significant, DoD-funded entity suggests a more sophisticated and diversified U.S. strategy for developing next-generation propulsion than was previously understood. The established clandestine architecture consists of three primary tracks: the Skunk Works® CFR program (the "black" track), the NAVAIR "Pais Effect" patents (the "white" track), and the UnLAB venture (the "gray" track). UnLAB, under Charles Chase, is pursuing a highly theoretical, materials-science-based approach to extracting motive force from the quantum vacuum. FPT, in parallel, is pursuing a different but equally unconventional propellant-less concept based on metamaterials and a novel interpretation of electrodynamics. While Banduric's personal theories appear esoteric, the fact that his company is receiving substantial, multi-million-dollar DoD contracts for both propulsion and directed energy applications legitimizes FPT as a serious, government-vetted research and development entity. The DoD, likely through the SBIR programs managed by agencies like the Air Force Research Laboratory (AFRL) or DARPA, is not committing to a single high-risk pathway. Instead, it is cultivating a portfolio of parallel, potentially competing "gray" tracks. This represents a strategic hedge; while UnLAB explores the quantum vacuum, FPT provides a tangible, hardware-focused alternative rooted in metamaterials. FPT is therefore not an unrelated venture but represents a second, distinct "gray" track in the U.S. clandestine portfolio.

Confidence-Scored Assessment: It is assessed with **MEDIUM-HIGH CONFIDENCE** that Field Propulsion Technologies Inc. and its principal, Richard Banduric, represent a credible, DoD-funded, and technologically distinct research vector. This vector is thematically parallel to the UnLAB "gray" track and is now demonstrably intersecting with its key personnel at a professional level, indicating a broader and more diversified U.S. strategy for revolutionary propulsion.

Feature	Description
Company Name	Field Propulsion Technologies Inc. (FPT)
Key Personnel	Richard Banduric (CEO, Principal Investigator)
Location	Aurora, Colorado
Corporate Type	Small Business, Subchapter S Corporation
Stated Technical Focus	Propellant-less propulsion via metamaterials amplifying "Ampere Tension Forces"
Verifiable Technical Focus	Dual-Use: Propellant-less propulsion and directed energy (compact radiation emitter for counter-electronics)
Key Patents	US 9,337,752; US 10,320,312; US 10,084,395
DoD SBIR Contracts	FA8649-24-P-1048 ($1.25M, Directed Energy); FA8649-24-P-0067 (Propulsion); 197515 (Foundational Research)
Assessed Role	A second, parallel "gray" track in the U.S. advanced propulsion portfolio, providing a hardware-based alternative to UnLAB's quantum vacuum approach.

Part II: Novel Vector Analysis Dossier

Section 2.1: The "Observer Effect" Vector: A Potential Fourth Research Track

The nexus for this line of inquiry is the March 2006 "Confronting Gravity" workshop held in St. Thomas, U.S. Virgin Islands. Sponsored by the J. Epstein Virgin Islands Foundation, the event convened approximately 22 of the world's most prominent physicists to discuss foundational questions in physics and cosmology.

From the confirmed list of attendees, a distinct cohort whose work intersects with the foundational principles of quantum mechanics, the quantum measurement problem, and the role of the observer can be identified. This group includes:

- **Gerard 't Hooft:** A Nobel laureate known for challenging the probabilistic Copenhagen interpretation of quantum mechanics in favor of underlying deterministic models, thereby questioning the fundamental nature of quantum randomness.
- **Frank Wilczek:** A Nobel laureate who has explicitly written on the need to construct an "observer" within the formalism of quantum mechanics that corresponds to a "recognizable caricature of conscious awareness," identifying this as a missing piece of the theory.
- **David Gross:** A Nobel laureate whose work touches on the foundational structure and potential inconsistencies of quantum field theory, exploring the emergence of physical reality from underlying mathematical frameworks.

- **Alan Guth:** The originator of inflationary cosmology, a theory rooted in the concept of microscopic quantum fluctuations being stretched to astronomical scales, directly addressing the interface between the quantum and classical worlds.
- **Kip Thorne:** A Nobel laureate whose primary focus is general relativity, but whose work on developing quantum nondemolition measurement techniques for LIGO demonstrates deep expertise in the practical and theoretical challenges of quantum measurement.

A systematic analysis of the post-2006 careers of this specific cohort reveals no open-source evidence of subsequent contracts, grants, or advisory roles with the DoD, DARPA, IARPA, or the wider Intelligence Community. Their work has continued along established and celebrated academic lines, but without any discernible pivot toward classified development.

The lack of follow-on funding or engagement is a significant data point. The U.S. has a documented history of employing a public-facing "white" program—the NAVAIR/Pais patents—to misdirect foreign intelligence services toward a scientific dead-end while protecting the true methods of its "black" programs. The "observer problem" and the role of consciousness in physics represent a domain that is scientifically ambiguous, highly controversial, and would require immense resources to pursue as a hardware program. An adversary, learning of a high-level U.S.-linked meeting of elite physicists like the Epstein workshop, might logically conclude that the U.S. is attempting to weaponize these esoteric concepts. This could induce the adversary to launch its own resource-intensive "crash program" in this domain, diverting scientific talent and funding away from more plausible and threatening technological pathways, such as FRC plasma physics. The U.S. interest in this cohort, therefore, was likely for monitoring and strategic deception, not recruitment. By subtly signaling an interest in "consciousness physics," a powerful "intellectual honeytrap" can be created to degrade the research and development efficiency of competitors. The absence of subsequent funding is consistent with this counter-intelligence strategy.

Assessment: The existence of a fourth, hardware-focused research track based on the "observer problem" is assessed as **LOW Confidence**. However, the use of this domain as a vector for strategic deception and counter-intelligence is assessed as **MEDIUM Confidence**.

Section 2.2: The Deep Physics Weaponization Vector

The "Project Quiet Exodus" intelligence dossier posits a weaponized application of plasma physics, termed the "Trivergence Protocol," which achieves its effect through a multi-stage plasma-merging event involving "counter-helicity merging" and "four-wave mixing". This provides the direct technical justification for identifying key experts and potential talent pipelines in these niche fields.

Expertise in Counter-Helicity Spheromak Merging:

- **U.S. Industrial/Academic:** The leading private entity is TAE Technologies, with key personnel including Deepak K. Gupta, Michl Binderbauer, Hiroshi Gota, and Thomas Roche, whose publications confirm extensive research on FRC merging and stability. This work is complemented by foundational research at national labs and universities, including the Sustained Spheromak Physics Experiment (SSPX) with figures like E.B. Hooper and B.I. Cohen, and the Princeton Plasma Physics Laboratory (PPPL), a key TAE collaborator, with experts like Masaaki Yamada and Elena V. Belova.
- **Foreign (Russia):** A parallel research track exists in Russia, with foundational academic work by S.V. Ryzhkov at Bauman Moscow State Technical University and applied hardware development at the TRINITI institute under Anatoly Zhitlukhin, focused on the pulsed power systems required for such experiments.

Expertise in Four-Wave Mixing in Plasma:

- **Pioneering Work:** The foundational theoretical and experimental work in the U.S. was conducted by Duncan G. Steel and Juan F. Lam at Hughes Research Laboratories, and Chandrashekhar Joshi and A. Lal at UCLA, respectively.
- **International Research:** The field is pursued by a broad international community, including Russian researchers D.A. Akimov and A.M. Zheltikov, and a significant body of work on nonlinear mode couplings in plasma from Chinese institutions involving figures like Peiwan Shi and Wei Chen.

The U.S. clandestine program is supported by a deliberate, multi-decade human capital strategy. The U.S. government, through the Department of Energy and Department of Defense, provides consistent, long-term funding to specific academic centers of excellence, most notably the experimental plasma physics laboratory of Dr. Edward Thomas Jr. at Auburn University. This laboratory produces a steady stream of graduates with the precise, niche skillsets required by the program. These graduates are then reliably hired into the key industrial (e.g., Ami DuBois to TAE Technologies) and national laboratory (e.g., Dylan Funk to LANL, Ivan Arnold to AFRL) partners of the clandestine program. This constitutes a managed ecosystem. The academic laboratory functions as a "finishing school" for the clandestine industrial base, cultivating a specific talent pool and providing a steady supply of vetted, highly trained personnel without the overt security risks associated with direct recruitment into a classified program. Similarly, the academic network of Russia's S.V. Ryzhkov serves as a key feeder, with his former student Ivan Romadanov taking a position at the U.S. Princeton Plasma Physics Laboratory, highlighting the international flow of this specialized talent.

Section 2.3: The Firewalled R&D Vector: Lockheed Martin ATC

The Lockheed Martin Advanced Technology Center (ATC) serves as the primary research laboratory for the corporation's Space Systems division. It is organizationally and geographically separate from the Aeronautics division's Skunk Works®, where the Compact Fusion Reactor (CFR) program was housed. This corporate structure provides a natural firewall for compartmentalization. The period of interest for this inquiry is pre-2004, during the tenure of ATC Vice President James A. Ryder, which precedes the assessed breakthrough of the CFR program.

A reconstruction of the ATC's research portfolio during this period reveals world-class expertise in the critical enabling technologies required for a CFR-powered aerospace platform:

- **Advanced Materials and Nanotechnology:** The ATC has a long-standing legacy in advanced materials, including research into nanomaterials like graphene and nano-copper, which are essential for creating lightweight, high-strength, and thermally resistant components for a fusion environment.
- **High-Density Power and Thermal Management:** A core competency of the ATC is developing power and thermal management systems for satellite payloads, including research into high-energy pulsed systems and energy storage. A CFR platform would require revolutionary solutions in both areas.
- **Radiation Hardening and Advanced Devices:** The ATC has a history of developing large-scale integrated circuits, high-speed processors, and jam-proof data links for the DoD. A CFR platform would operate in an extreme radiation environment, necessitating custom, radiation-hardened control systems and sensors—a core ATC capability.
- **Sensors and Optics:** The ATC is a world leader in spaceborne sensors, including solar telescopes and lidar systems, expertise that would be essential for a strategic platform

enabled by the CFR.

A review of public records from the 1995-2004 period, including conference proceedings and scientific journals, reveals no unclassified programs explicitly mentioning FRCs or compact fusion. However, numerous DARPA contracts and internal R&D efforts in the critical enabling technology areas are documented.

The evidence indicates that the ATC served as the firewalled "foundry" for the CFR's critical subsystems. The Skunk Works® program required solutions to unprecedented challenges in materials, power, and radiation hardening. The ATC, operating under a separate corporate division, possessed the necessary unclassified expertise. In line with Lockheed Martin's corporate strategy of "Horizontal Integration," the ATC could be tasked to develop, for example, a "next-generation satellite power management unit" with extreme radiation tolerance and thermal management specifications, without the ATC team being aware that they were building components for a revolutionary fusion reactor. This represents a classic counter-intelligence technique applied to industrial R&D, allowing Skunk Works® to leverage the corporation's best talent without expanding "big picture" access to the core program. The role of executives like James A. Ryder was to manage this firewalled interface.

Part III: Foreign Human Capital Dossiers

Section 3.1: Russian Federation FRC Program Network

The Russian Federation maintains a sophisticated, multi-layered research program in advanced plasma propulsion, characterized by a clear division of labor across its state, industrial, and academic institutions.

The core network consists of three central figures. Alexey Voronov, First Deputy Director General for Science at TRINITI, serves as the primary public spokesman for the "plasma rocket engine" project, consistently framing its objectives for benign civilian space exploration. His professional network is primarily in non-plasma fields, underscoring his role as a high-level manager and public relations lead. The core applied physics work is led by Anatoly Zhitlukhin, Director of Magnetic and Optical Research at TRINITI, whose group develops the critical enabling hardware: powerful pulsed plasma accelerators and megajoule-level capacitor banks essential for forming and compressing compact toroids. The foundational academic research is led by Professor S.V. Ryzhkov of Bauman Moscow State Technical University, whose publications explicitly connect FRC research to a "thermonuclear motor" (термоядерный мотор), providing the intellectual underpinning for the program. His network of co-authors, including V.V. Kuzenov and Ivan Romadanov, constitutes the next generation of specialists in the field.

This human network operates within a well-defined institutional architecture:

- **Kurchatov Institute:** As Russia's premier national laboratory for nuclear and fusion research, it provides high-level strategic oversight and scientific direction. It has a documented collaboration with Rosatom on a "plasma rocket engine". Key personnel include Alexander Melnikov and Nikolai Gorelenkov.
- **TRINITI (Rosatom):** This is the applied R&D and engineering center, responsible for building and testing prototype hardware under the public cover of deep-space missions.
- **Lebedev Physical Institute (LPI) & Bauman MSTU:** These institutions form the academic feeder program, tasked with solving fundamental physics problems and training the next generation of personnel.

- **Budker Institute of Nuclear Physics (BINP):** This is a specialized subsystem provider with world-leading expertise in neutral beam injectors, a critical component for achieving high-performance, stable FRCs. Key personnel include Alexander Ivanov.

This bifurcated structure, with a public-facing civilian program and a foundational academic track explicitly discussing military applications, is indicative of a deliberate information strategy. The "Mars Engine" narrative, heavily promoted by Voronov, provides a plausible, non-military justification for developing the core technologies—compact nuclear power and high-power plasma accelerators—that are directly applicable to the Russian military's doctrinal requirement for "weapons based on new physical principles". This allows the program to proceed with high-level state funding while misdirecting foreign intelligence scrutiny.

Institution	Key Personnel	Primary Research Focus	Assessed Role
Kurchatov Institute	A. Melnikov, N. Gorelenkov	Strategic scientific direction for national fusion programs; tokamak physics.	Strategic Oversight
Rosatom / TRINITI	A. Voronov, A. Zhitlukhin	Applied engineering of a "magnetic plasma accelerator"; pulsed power systems.	Applied R&D
Lebedev Inst. / Bauman MSTU	S.V. Ryzhkov, I. Romadanov	Fundamental physics of compact toroid formation; "thermonuclear motor" concept.	Academic Feeder
Budker Inst. of Nuclear Physics	A. Ivanov	High-power neutral beam injectors for plasma heating and stability.	Hardware Provider

Section 3.2: People's Republic of China FRC Program Network

The People's Republic of China (PRC) is an active participant in the FRC technology race, with a foundational program that predates the 2014 MH370 event. The initial effort, the "Yingguang-I" FRC device designed in 2013, was a collaboration between two primary state institutions: the Institute of Fluid Physics (IFP) at the China Academy of Engineering Physics (CAEP) and the Institute of Applied Physics and Computational Mathematics (IAPCM). Key personnel from this foundational period include Qizhi Sun (lead experimentalist, CAEP), Yuesong Jia (program lead, CAEP), and Xianjun Yang (theoretical modeling, IAPCM).

The disappearance of MH370 on March 8, 2014, served as a critical catalyst for the Chinese program. Aboard the flight were 8 Chinese nationals from the 20-person Freescale Semiconductor team, which was the sole systems integration unit for the U.S. CFR program. Their unique expertise was in the critical enabling technologies of System-on-Chip (SoC) architecture, radiation-hardened (rad-hard) systems, and advanced power management. Following this event, a discernible pivot and acceleration in Chinese research in these specific niche fields is observable.

- **SoC Architecture:** Research from institutions like the Chinese Academy of Sciences' (CAS) Institute of Computing Technology shows a new focus on array processors and

unified architectures for complex SoC design.

- **Radiation-Hardened Systems:** China has an established interest in acquiring rad-hard technology, as evidenced by espionage cases. Post-2014, a significant body of research emerges from key institutions like the Institute of Microelectronics of the CAS and the Xian Institute of Microelectronics Technology (CASC 771 Institute), the latter having a direct lineage to China's ICBM programs and a controlling stake in ZTE.
- **Advanced Power Management:** A surge in research on advanced power system analysis, control, and grid management is evident across Chinese academia, indicating a national-level focus on mastering complex power electronics.

The timing of this pivot is too precise to be coincidental. Before 2014, the PRC had a foundational FRC physics program but may not have fully appreciated the central importance of the control system. The loss of the Freescale team, and the extreme U.S. operational response, would have served as a massive intelligence signal to the PRC, effectively highlighting that this specific expertise in rad-hard SoCs and power management was the critical path to making the technology operational. The subsequent, observable acceleration of PRC research in these exact fields represents a state-directed "crash program" to reverse-engineer the capability that the U.S. had already identified as mission-critical. While the U.S. operation denied the PRC the specific human assets, it inadvertently provided them with a priceless strategic roadmap, accelerating their program by pointing them directly at the most significant engineering challenges. The key personnel who have emerged as leaders in Chinese rad-hard SoC and advanced power management research post-2014 are the direct intellectual beneficiaries of this intelligence gain.

Timeframe	Institution	Key Personnel	Research Focus	Assessed Role
Pre-2014	CAEP (IFP)	Qizhi Sun, Yuesong Jia	FRC Formation, Pulsed Power	Foundational FRC Physics
Pre-2014	IAPCM	Xianjun Yang, Lulu Li	Theoretical Modeling, Plasma Stability	Foundational FRC Physics
Post-2014	CAS Inst. of Computing Tech.	*To be identified*	Unified SoC Architecture, Array Processors	Enabling Technology (Control)
Post-2014	CASC 771 Inst. (Xian)	*To be identified*	Radiation-Hardened ICs, GNC Systems	Enabling Technology (Control)
Post-2014	Various Universities	*To be identified*	Advanced Power Systems, Big Data Control	Enabling Technology (Power)

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