# Architecting Advantage: Leveraging Palantir Foundry to Model DoD Doctrine and Drive Innovation in Electromagnetic Spectrum Operations

## Executive Summary

In an era increasingly defined by data-centric warfare and the pursuit of decision advantage, the U.S. Department of Defense (DoD) faces a critical challenge: its foundational governing principles—doctrine, strategy, and policy—remain largely inert, locked within a vast and disconnected library of static documents. This report posits that for the DoD to fully realize the vision of Joint All-Domain Command and Control (JADC2), its doctrine can no longer be a passive reference; it must be transformed into a dynamic, queryable, and machine-readable strategic asset. The failure to do so risks building advanced operational systems on a brittle and opaque foundation, hindering agility and slowing adaptation to emerging threats.

This analysis provides a comprehensive methodology for utilizing the Palantir Foundry platform to execute this transformation. It details an end-to-end process, beginning with the ingestion of the unstructured corpus of DoD and U.S. Air Force doctrinal documents and culminating in the creation of a high-fidelity semantic model. This model functions as a "digital twin" of the organizations themselves, mapping their structure, missions, capabilities, and governing rules into a unified, computable framework. The core of this framework is the Foundry Ontology, a semantic layer that connects digital representations to their real-world counterparts, from individual units and weapon systems to abstract concepts like mission objectives and operational authorities.

The report demonstrates the immediate analytical power of this model, showcasing its ability to answer complex strategic queries, uncover hidden dependencies, and identify risks that are currently obscured within thousands of pages of text. More critically, it applies this capability to a pressing strategic problem: informing and accelerating innovation in the vital warfighting domain of Electromagnetic Spectrum Operations (EMSO). By extending the doctrinal model to include the specific concepts, systems, and tactics of EMSO, the platform can be used to conduct sophisticated gap analyses, identify doctrinal seams between services, and pinpoint opportunities for technological and procedural innovation.

The ultimate value of this approach is realized through the integration of Palantir's Artificial Intelligence Platform (AIP). By leveraging AI agents that can reason over the doctrinal ontology, commanders and strategists can wargame future scenarios, simulate the impact of new adversary capabilities, and generate data-driven courses of action for investment and adaptation. This transforms doctrinal analysis from a retrospective, historical exercise into a predictive and forward-looking strategic advantage. The key finding of this report is that Palantir Foundry provides the necessary integrated toolchain to not only understand current doctrine but to actively model, test, and evolve future warfighting concepts, turning the DoD's foundational knowledge into a primary driver of innovation and a cornerstone of enduring military superiority.

## Section 1: The Foundational Layer - Transforming Unstructured Doctrine into Digital Assets

The initial and most critical phase in this strategic endeavor is the conversion of raw, unstructured doctrinal documents into a governed, secure, and analysis-ready digital corpus within the Palantir Foundry platform. This foundational layer is the bedrock upon which all subsequent modeling, analysis, and AI-driven insight generation rests. It is a process that moves the vast library of DoD and Air Force doctrine, policy, and strategy from disconnected file shares and websites into a cohesive, single source of truth.

### 1.1 The Strategic Imperative: Doctrine as Data

The modern operational environment demands speed, integration, and adaptability. Initiatives like Combined Joint All-Domain Command and Control (CJADC2) are predicated on the seamless fusion of data from a multitude of sensors, platforms, and networks to achieve decision dominance. However, a significant portion of the DoD's most fundamental data—the rules, authorities, and procedures that govern all military action—remains sequestered in unstructured formats such as PDFs, Microsoft Word files, and static web pages. This creates profound data silos, rendering cross-functional analysis of doctrinal coherence a manually intensive, time-consuming, and often incomplete task.

The strategic imperative, therefore, is to fundamentally reframe this corpus of documents not as a library to be read, but as a vast, untapped dataset to be processed, queried, and understood at machine speed. The objective is to unlock the latent knowledge embedded within these texts, making the intricate web of relationships between units, missions, capabilities, and policies computable. This transformation is not merely a technical exercise; it is a prerequisite for building a truly data-driven military organization. By treating doctrine as data, the DoD can begin to analyze its own operational DNA, identify internal inconsistencies, and adapt its core logic with the same agility it seeks to apply in the battlespace.

This process itself yields immediate strategic value. The act of creating a unified, version-controlled, and governed digital library of doctrine provides an unparalleled resource for legal, training, and compliance functions. More profoundly, the rigor required to build the data integration pipelines forces the organization to confront its own "data debt" within the doctrinal corpus. As the system attempts to reconcile documents, it will inevitably surface conflicts: policies that reference rescinded doctrine, terms used inconsistently across services, or ambiguous command relationships. This automated audit of doctrinal coherence provides a tangible return on investment long before the first AI model is trained, building institutional momentum for the more advanced analytical phases to follow.

### 1.2 Ingesting the Doctrinal Corpus into Foundry

Palantir Foundry is engineered to integrate data from a wide array of disparate sources, a capability essential for tackling the distributed nature of DoD documentation. The ingestion process begins by establishing secure connections to the various repositories where these documents reside, which may include DoD web domains, internal SharePoint sites, collaboration platforms, and secured network drives.

Foundry's Data Integration Services provide a suite of tools to accomplish this at scale. The process typically involves:

* **Setting up Data Connections:** Using Foundry's native connectors, secure connections are established to the source systems. For file-based sources, this can be achieved by deploying a lightweight Foundry **agent** within the DoD's network environment, which can securely monitor folders and transmit new or updated files into the platform.
* **Configuring Syncs:** Once a connection is established, a **sync** is configured to transfer the data. For doctrinal documents, **file-based syncs** are the primary mechanism. These syncs can be scheduled to run periodically (e.g., nightly) to capture any changes, ensuring the platform always reflects the latest versions of documents. This creates a raw dataset within Foundry containing the files themselves.
* **Creating Media Sets:** The raw files are then processed into **media sets**, which are Foundry's specialized data structure for managing unstructured data like PDFs, images, and text documents. This step effectively unpacks the files and prepares them for further analysis, while preserving the original source file for reference.

This approach allows Foundry to create a centralized, unified repository that can handle the full spectrum of doctrinal materials, from structured tables embedded within PDFs to the unstructured narrative text that forms the bulk of the content.

### 1.3 Automated Processing and Semantic Enrichment with NLP and LLMs

With the documents ingested as media sets, the next step is to transform the raw text into a structured, analyzable format. This is accomplished through a data pipeline that applies a sequence of Natural Language Processing (NLP) and Large Language Model (LLM) techniques. This pipeline can be built and managed within Foundry's **Code Repositories** or **Code Workbooks** environments, using languages like Python and Spark.

The key stages of this processing pipeline include:

1. **Text Extraction:** The pipeline first extracts the raw text content from each document in the media set. Foundry's tools can handle various formats, parsing text from PDFs, Word documents, and HTML files.
2. **Document Chunking:** LLMs have limitations on the amount of text they can process at once (context windows). Therefore, large documents, which can span hundreds of pages, must be broken down into smaller, semantically coherent chunks. This is a critical step for effective analysis, ensuring that each chunk represents a complete thought or topic, such as a paragraph or a section.
3. **Term and Concept Extraction:** This is the first layer of ontology learning. Initial NLP techniques, such as part-of-speech tagging and noun-phrase extraction, are applied to each chunk to identify candidate terms and concepts. These are the potential building blocks of the future ontology, such as "Air Force Doctrine Publication," "command and control," "electronic attack," or "freedom of action".
4. **Embedding Generation:** To enable more powerful semantic analysis, the pipeline uses a language model to generate a vector embedding for each text chunk. An embedding is a numerical representation of the text's meaning. This process transforms the entire doctrinal corpus into a high-dimensional vector space where chunks with similar meanings are located close to one another. This is the foundation for semantic search, similarity analysis, and more advanced LLM-based relation extraction.

This automated enrichment process converts a static library of documents into a dynamic, feature-rich dataset, primed for the construction of the semantic model.

### 1.4 Ensuring Security, Governance, and Data Lineage

Handling sensitive DoD information, even unclassified doctrine, requires an uncompromising approach to security and governance. Palantir's platform was designed with these requirements at its core, having served the U.S. government and its allies for years.

Key security and governance features integral to this process include:

* **Granular Access Controls:** Foundry implements a multi-layered access control model. Permissions can be managed based on a user's role (e.g., 'EMSO Analyst'), but also on data markings. This means that access to specific documents or even individual data points can be restricted based on classifications or handling caveats (e.g., For Official Use Only, Controlled Unclassified Information). All access controls are inherited throughout the data lifecycle, ensuring that a user who cannot see a source document also cannot see the insights derived from it.
* **Encryption:** All data within Foundry is encrypted, both in transit between systems and at rest within the platform's storage layer, using industry-standard protocols.
* **Comprehensive Auditing:** Every action taken within the platform—from a data sync to a user query to an update of the ontology—is recorded in an immutable audit log. This provides a complete, transparent record of who accessed what data, when they accessed it, and what they did with it, which is essential for accountability and security oversight.
* **Data Lineage:** Perhaps the most critical governance feature for this use case is Foundry's automatic **Data Lineage**. The platform graphically tracks the full history of every piece of data. An analyst viewing an object in the final semantic model—for example, a link stating that a specific Air Force Wing executes a particular mission—can, with a single click, trace that fact all the way back through the processing pipeline to the exact sentence in the specific source PDF from which it was extracted. This end-to-end traceability is fundamental for building trust in the system's outputs and ensuring that all analysis is grounded in and auditable against authoritative source doctrine.

## Section 2: Building the Semantic Core - A Doctrinal Ontology for the Department of Defense

With the doctrinal corpus ingested, processed, and secured, the focus shifts from managing raw data to creating structured knowledge. This section details the methodology for constructing a high-fidelity ontology within Palantir Foundry. This ontology will serve as the semantic core of the entire system, accurately modeling the complex entities, properties, and relationships that define and govern the DoD and the Air Force.

### 2.1 Principles of Ontology Learning from Text

Ontology Learning (OL) is the (semi-)automatic process of building an ontology—a formal, explicit specification of a shared conceptualization—from various types of data, with unstructured text being a primary source. The goal is to move beyond simple keyword searching and create a structured model of a domain's concepts and the relationships between them.

Historically, OL has relied on linguistic and statistical methods, such as analyzing grammatical patterns or term co-occurrence to infer relationships. While effective, these methods can be brittle and often struggle with the nuance and ambiguity of natural language. The advent of powerful LLMs has introduced new, more sophisticated techniques for entity and relation extraction. These models can interpret context and infer relationships with a much higher degree of semantic understanding. However, the process is not without challenges, including ensuring domain-specific accuracy, resolving ambiguity, and discovering the formal axioms that govern the relationships between concepts.

Palantir Foundry's approach embraces a hybrid model that combines the scale and speed of automated extraction with the rigor and expertise of human oversight. The platform provides tools for automated NLP and LLM-based analysis to generate candidate ontological elements, but critically, it also offers powerful, user-friendly interfaces for domain experts to review, refine, validate, and govern the final ontology. This human-in-the-loop methodology is essential for building an ontology that is not only computationally useful but also a trusted and accurate reflection of the real world.

### 2.2 The Foundry Ontology: A Digital Twin of the Organization

Within the Palantir ecosystem, the Ontology is the central organizing principle. It is conceived as far more than a simple knowledge graph; it is a dynamic, operational "digital twin" of an organization. Its purpose is to create a semantic layer that bridges the gap between an organization's digital assets (like datasets and AI models) and their real-world counterparts, which can range from physical assets like aircraft and equipment to conceptual entities like missions, policies, and operational plans.

This digital twin is composed of several core components :

* **Objects:** These are the fundamental "nouns" of the domain. In the context of DoD doctrine, an object could be a Unit, a Personnel member, a piece of Equipment, a Mission, or a PolicyDocument. Each object represents a distinct real-world entity.
* **Properties:** These are the attributes or characteristics of an object. For example, a Unit object would have properties like UnitName, ServiceBranch, and CommandEchelon. A PolicyDocument object would have properties like DocumentTitle, PublicationDate, and Status (e.g., 'Active', 'Rescinded').
* **Links:** These are the "verbs" that define the relationships between objects. Links are the semantic glue of the ontology, encoding how different entities are connected. For instance, a link could represent that a Unit *Is\_Commanded\_By* a Personnel object, or that a Mission *Is\_Authorized\_By* a PolicyDocument.
* **Actions:** This is the "kinetic" element of the ontology, a feature that distinguishes it from passive analytical models. Actions are user-defined functions that allow for the structured modification of objects and their properties. They can trigger complex workflows, send notifications, and even orchestrate changes in external systems. The role of Actions will be explored in detail in Section 4.

This ontological structure allows for the creation of a rich, multi-faceted model of the DoD. It is not just a hierarchical org chart but a web of interconnected semantic and kinetic elements that can be queried, analyzed, and acted upon. The design of this model is not merely a technical task; it is an act of codifying institutional knowledge, which has profound implications. By creating a formal, machine-readable representation of doctrine, the ontology becomes more than a passive analytical tool—it becomes an active operational surface. The inclusion of kinetic elements like Actions means the system is built for write-back capabilities. An analyst could not only query the current state of doctrine but could also trigger a predefined Action to propose a change to a mission's tasking. This action could initiate a formal review workflow, automatically notify relevant stakeholders, and, upon approval, update the ontology itself, bridging the gap between analysis and operations.

### 2.3 Step-by-Step Ontology Construction in Foundry

Building the doctrinal ontology is a multi-phase process that blends expert-driven design with automated data processing.

**Phase 1: Defining the Schema in Ontology Manager** The process begins with human expertise. A team of military strategists, doctrinal experts, and data modelers convenes to define the initial schema of the ontology. Using Foundry's **Ontology Manager**, a graphical, low-code interface, they define the primary object types, the properties for each object, and the types of links that can exist between them. This is a foundational step where the conceptual framework of the military organization is translated into a formal structure. For example, the team would decide to create an object type called Unit and specify that it must have a UnitName property (a string) and can be linked to another Unit object via an Is\_Subordinate\_To link. This manual, expert-driven design ensures the ontology is grounded in a correct and meaningful understanding of the domain.

**Phase 2: Extracting Entities and Relations** Once the schema is defined, the next phase is to populate it with instances extracted from the processed doctrinal texts. This phase leverages the NLP outputs generated in Section 1 and uses a combination of techniques to identify and map information to the ontology schema:

* **Rule-Based Extraction:** For well-structured information, simple rules and patterns can be highly effective. For example, a regular expression could be used to identify all document IDs that follow a specific format (e.g., 'AFDP XX-XX').
* **LLM-Based Extraction:** For more complex, narrative text, LLMs are employed. Within a Foundry **Code Workbook**, a prompt can be engineered to instruct an LLM to read a text chunk and extract entities and relationships that match the predefined ontology schema. For example, the prompt might ask the model to identify any (Subject, Predicate, Object) triples where the subject is a known Unit and the predicate describes an action like "is responsible for," mapping this to the appropriate link in the ontology. This two-step approach—extracting entities first, then relations—has been shown to improve consistency.

**Phase 3: Ontology Hydration** Hydration is the process of building robust, production-grade data pipelines that continuously feed the populated data into the live ontology. Foundry provides two primary tools for this:

* **Pipeline Builder:** For many extraction tasks, **Pipeline Builder** offers a graphical, point-and-click interface. An analyst can visually map the columns of a dataset (e.g., a dataset of extracted Unit names) to the corresponding properties of an object type in the ontology. Pipeline Builder then automatically generates and manages the underlying transformation code (e.g., Spark SQL or Python) required to build and maintain the pipeline.
* **Code Repositories:** For more complex transformations that require custom logic (e.g., advanced entity resolution or disambiguation), analysts can write Python or Spark code in **Code Repositories**. This provides maximum flexibility while still integrating fully with Foundry's data lineage, scheduling, and health check systems.

This phased approach ensures that the final ontology is both comprehensive, drawing on the full depth of the textual corpus, and accurate, with its structure and logic validated and governed by human experts.

To provide a concrete example, the following table outlines a potential core schema for a DoD doctrinal ontology. This serves as a tangible blueprint for the initial design phase in the Ontology Manager.

| Object Type | Key Properties (with Data Type) | Example Instance |
| --- | --- | --- |
| Unit | UnitName (string), ServiceBranch (enum: Army, AF, etc.), Echelon (string), MissionStatement (string) | 3rd Fighter Wing |
| PolicyDocument | DocumentTitle (string), DocumentID (string), PublicationDate (date), Status (enum: Active, Rescinded) | AFDP 3-85 |
| Mission | MissionName (string), MissionType (string: e.g., Offensive Counter-Air), Description (string) | Achieve EMS Superiority |
| Capability | CapabilityName (string), CapabilityDescription (string), Domain (enum: Air, Space, Cyber, EMS) | Airborne Electronic Attack |
| GeographicArea | AreaName (string), AreaType (enum: AOR, Theater), Coordinates (geospatial) | INDOPACOM AOR |
| **Link Type** | **Source Object -> Target Object** | **Description** |
| Is\_Subordinate\_To | Unit -> Unit | Represents the command hierarchy. |
| Is\_Governed\_By | Unit -> PolicyDocument | Links a unit to the doctrine that governs its actions. |
| Executes | Unit -> Mission | Assigns a mission to a specific unit. |
| Requires | Mission -> Capability | Defines the capabilities needed to perform a mission. |
| Provides | Unit -> Capability | Indicates a unit possesses a certain capability. |
| Applies\_To | PolicyDocument -> GeographicArea | Scopes a policy to a specific region. |

## Section 3: The Semantic Model in Action - A Digital Twin of Organizational Structure and Mission

Once the doctrinal ontology is populated with data, it transforms from a static data model into a living, interactive semantic representation of the DoD's structure, missions, and governing principles. This section explores the immediate analytical value of this "digital twin," demonstrating how it enables a level of insight and strategic awareness that is impossible to achieve through the traditional, manual review of documents.

### 3.1 From Static Org Charts to a Dynamic Knowledge Graph

Traditional representations of military structure, such as PowerPoint organization charts, are inherently limited. They are static, quickly become outdated, and typically only represent a single dimension of relationships—the formal command hierarchy. The Foundry ontology, by contrast, creates a dynamic, multi-relational knowledge graph that can represent numerous types of relationships simultaneously. An analyst can visualize not only the Is\_Subordinate\_To links that form the chain of command, but also the functional (Executes a Mission), capability-based (Provides a Capability), and doctrinal (Is\_Governed\_By a PolicyDocument) relationships, all within a single, unified view.

This dynamic model is made accessible to users through a suite of intuitive, low-code analytical applications within Foundry :

* **Object Explorer:** This application acts as a powerful semantic search engine for the ontology. A user can perform searches that go far beyond simple keywords. For example, instead of searching for the string "cyber," a user can search for all Unit objects whose MissionStatement property contains "cyber" or that are linked to a Capability object in the 'Cyber' domain. This allows for precise, concept-based discovery across the entire organization.
* **Quiver:** This is a visual, graph-based analysis tool. An analyst can start with a set of objects (e.g., a specific Air Force command) and use Quiver to "search around" them, graphically exploring all connected objects and their relationships. This allows for the intuitive discovery of patterns and connections that would be invisible in a tabular or textual format.

The creation of this model effectively establishes a "doctrinal common operational picture (COP)." In traditional military operations, a COP provides a single, shared visualization of the physical battlespace to ensure all participants have a common understanding. The doctrinal ontology serves an analogous purpose for the organizational, legal, and strategic environment. It takes the complex, dense world of doctrine, which is typically the purview of a small number of specialists, and makes it accessible and understandable to a much broader audience, including commanders, resource managers, and operators. This democratization of strategic understanding drastically shortens the learning curve for leaders at all levels and enables more informed, data-driven decision-making, directly fulfilling the promise of AI to reduce cognitive load and enhance command effectiveness.

### 3.2 Answering Complex Strategic Queries

The true power of the semantic model lies in its ability to synthesize information from thousands of pages of doctrine to answer complex, high-value strategic questions in seconds. These are queries that would currently require weeks of manual research by a team of experts, if they could be answered at all. The ontology allows for the chaining of multiple logical conditions across different object and link types to uncover critical insights.

Consider the following examples:

* **Query 1 (Readiness and Compliance):** *"Show all Air Force Wings whose primary Mission Requires a Capability that is defined in a PolicyDocument with a Status of 'Rescinded'."* This query traverses multiple links in the graph: from Unit to Mission, from Mission to Capability, and from Capability to PolicyDocument. The result is a highly actionable list of units that may be training or equipping for missions based on outdated or invalid doctrine, presenting a direct risk to readiness and compliance.
* **Query 2 (Joint Interoperability):** *"Identify all Units from the Air Force and the Army that Execute Missions of MissionType 'Integrated Air and Missile Defense' within the GeographicArea 'INDOPACOM AOR'. Then, for each of these units, display the distinct PolicyDocuments that Govern their operations."* This query would produce a side-by-side comparison of the governing doctrines for joint forces performing the same mission in the same theater. By analyzing the results, planners can rapidly identify potential doctrinal conflicts, interoperability seams, or differing rules of engagement that could cause friction or fratricide during a real-world operation.
* **Query 3 (Force Structure Analysis):** *"Starting with the Unit 'Air Combat Command', trace all Is\_Subordinate\_To links down three echelons. For each resulting Unit, display its stated Mission and all the Capabilities it Provides. Finally, aggregate the results by Capability."* This query provides a data-driven, doctrine-based summary of the actual capabilities resident within a major command. It moves beyond simply counting personnel or airframes and provides a functional view of the force structure. This can help leaders identify capability over-saturations or critical shortfalls within their organizations.

### 3.3 Visualizing Dependencies and Identifying Hidden Risks

Many of the most significant risks in a large organization lie in non-obvious, indirect dependencies. The semantic model makes these dependencies explicit and allows them to be visualized using Foundry's analytical tools like **Quiver** and **Contour**.

An analyst can, for example, select a single high-level Mission object and generate a dependency graph. This graph would visually display every component required to execute that mission: the specific Units tasked with it, the Capabilities they must possess, the Equipment that provides those capabilities, the Personnel skills required to operate the equipment, and the web of PolicyDocuments that authorize and govern the entire endeavor.

This visualization of the complete dependency chain enables a new kind of systemic risk analysis. A planner can now ask questions like:

* "What is the operational blast radius if this specific PolicyDocument is changed or rescinded?" The model can instantly highlight every Unit, Mission, and Capability that is directly or indirectly affected by that single document.
* "What is the impact of a delay in the delivery of a new Equipment type?" The model can trace which Capabilities will be degraded and which Missions will be put at risk.

By making the entire system of doctrine and structure transparent and queryable, the ontology allows leaders to understand and mitigate risks that were previously hidden in the complexity of the organization.

## Section 4: Application to Innovation Strategy - The Case of Electromagnetic Spectrum Operations (EMSO)

This section serves as the capstone of the analysis, demonstrating how the doctrinal semantic model can be applied to a specific, high-priority use case: developing and informing innovation strategy for Electromagnetic Spectrum Operations (EMSO). By extending the ontology to this critical domain and leveraging advanced AI capabilities, the platform can move beyond historical analysis to become a proactive engine for future capability development.

### 4.1 The EMSO Challenge: A Congested and Contested Domain

The electromagnetic spectrum (EMS) is now universally recognized as a physical warfighting domain, on par with land, sea, air, space, and cyberspace. It is the medium through which nearly all modern military functions are enabled, including command and control (C2), intelligence, surveillance, and reconnaissance (ISR), precision navigation and timing (PNT), and the delivery of kinetic effects. As stated in U.S. Air Force Doctrine Publication (AFDP) 3-85, *Electromagnetic Spectrum Operations*, global dependence on the EMS creates both opportunities and vulnerabilities, and achieving a desired degree of "EMS superiority" is essential for mission success in all other domains.

The primary challenges within this domain, as outlined in doctrine, are that the EMS is simultaneously congested, contested, and constrained. It is congested with friendly, neutral, and commercial signals; contested by adversaries actively seeking to deny its use through electronic warfare; and constrained by physics, technology, and national and international regulations. To innovate effectively in this space, the DoD must have a deep, systemic understanding of its own doctrinal approach to EMSO, the capabilities it possesses, and the gaps that exist.

### 4.2 Extending the Ontology: Modeling the EMSO Domain

To apply the semantic model to this challenge, the first step is to enrich the core DoD ontology with the specific concepts, entities, and relationships that define the EMSO domain. This process involves a direct, methodical translation of the concepts found in authoritative source documents like AFDP 3-85 into the formal structure of the Foundry Ontology. New object types, properties, and links are created in the **Ontology Manager** to represent the key elements of EMSO.

This extension allows the model to capture highly specific and nuanced relationships. For example, the ontology can now represent that an F-35A (an instance of the Aircraft object, which is a subtype of Equipment) Is\_Equipped\_With an AN/ASQ-239 (an EW\_System object). This EW\_System Provides the Capability of 'Electronic Support'. This Capability is required to Execute an EMSO\_Tactic of 'Threat Warning', which is part of the overarching Mission of 'Defensive Counter-Air'. This entire chain, from a piece of hardware to a strategic mission, becomes an explicit, queryable path within the graph.

The following table provides a concrete example of how key concepts from AFDP 3-85 can be mapped directly into Foundry's ontological framework.

| EMSO Concept (from AFDP 3-85) | Foundry Representation | Type | Example Properties/Links |
| --- | --- | --- | --- |
| Electromagnetic Spectrum Operations (EMSO) | EMSO\_Mission | Object | MissionType: 'EMSO', Links to Unit via Executes |
| Electromagnetic Warfare (EW) | EW\_Tactic | Object | TacticType: (EA, EP, ES), Links to EW\_System |
| Electromagnetic Attack (EA) | Degrade\_Effect | Link | Source: EW\_System, Target: Adversary\_System |
| Electromagnetic Protection (EP) | Protect\_Effect | Link | Source: EW\_System, Target: Friendly\_System |
| Electromagnetic Spectrum Management (ESM) | Spectrum\_Manager | Object (subtype of Personnel) | Role: 'Spectrum Manager', Links to Unit |
| EMS Superiority | EMS\_Control\_State | Property of GeographicArea | Value: 'Superiority' |
| Contested EME | EME\_Contested\_Status | Property of GeographicArea | Value: 'True' |
| Directed Energy (DE) | DE\_Weapon | Object (subtype of EW\_System) | WeaponType: 'High-Power Microwave' |

### 4.3 Identifying Doctrinal Gaps and Innovation Opportunities

With the EMSO-enriched ontology, planners can now conduct a rigorous, data-driven gap analysis of the Air Force's posture and doctrine in this domain. By formulating precise queries, they can surface inconsistencies, shortfalls, and opportunities for innovation that would be nearly impossible to find through manual document review.

* **Capability-to-Mission Mismatch:** A planner could execute a query like, *"Identify all Units that are tasked with Missions which Require the Capability 'Airborne Electronic Attack', but which are not doctrinally linked to any specific EW\_System object capable of providing that effect."* The results of this query would immediately highlight units that have a doctrinal responsibility for which they may be under-resourced or improperly equipped, flagging a critical gap for investment or force allocation.
* **Doctrinal Seams and Conflicts:** To ensure joint force effectiveness, doctrinal alignment is critical. A query could be structured to *"Compare the PolicyDocuments related to EMSO that Govern Air Combat Command and U.S. Space Force. Highlight any conflicting definitions for key terms like 'Spectrum Management' or identify any overlapping operational responsibilities."* This use of the ontology as a tool for deconfliction can prevent operational friction and streamline joint planning.
* **Innovation Hotspotting:** To guide future research and development, strategists need to know where cutting-edge concepts are—and are not—being integrated into doctrine. A query could *"Find all mentions of 'cognitive', 'agile', 'AI-driven', or 'autonomous' spectrum techniques within the entire doctrinal corpus. Map the PolicyDocuments where these terms appear to the Units and Missions they are associated with."* If the resulting graph shows that these advanced concepts are concentrated in a few high-level strategy documents but are not linked to any specific operational units or tactics, it signals a clear innovation opportunity: the need to translate high-level theory into tangible, operationalized capabilities.

### 4.4 Wargaming and Scenario Modeling with Foundry AIP

This is where the methodology transitions from analysis of the present to simulation of the future. By integrating Palantir's Artificial Intelligence Platform (AIP), the doctrinal ontology becomes a sandbox for wargaming and strategic planning. AIP enables the creation of AI agents that can reason over the ontology, understand complex relationships, and propose or even automate actions.

A key tool for this is the **Scenario** primitive within Foundry. This feature allows an analyst to create a temporary, isolated "branch" or "what-if" version of the entire ontology. Within this sandboxed environment, they can introduce changes to model a hypothetical future without altering the official, production version of the data.

Consider the following workflow for informing innovation strategy:

1. **Create a Scenario:** An intelligence analyst models a new threat. They create a new Scenario named "Adversary GPS Jamming." Within this scenario, they add a new Adversary\_Capability object representing a novel, wide-area GPS jamming system and link it to a specific GeographicArea like the South China Sea.
2. **Invoke an AI Agent:** Using **AIP Logic**, a pre-configured AI agent is tasked to analyze the impact of this change. This agent is designed to execute a series of logical steps over the ontology, mirroring the analytical process of a human planner but at machine speed.
3. **Automated Impact Analysis:** The agent would automatically:
   * Query the scenario to find all friendly Missions that Require the Capability of 'GPS-based Navigation' and take place within the affected GeographicArea.
   * Trace the links from those missions to identify all Units assigned to them, flagging these units as "Mission-Critical, At Risk."
   * Assess the severity of the impact based on the properties of the units and missions involved.
4. **AI-Generated Courses of Action (COAs):** The agent's task doesn't end at impact analysis. It can then be prompted to search for solutions. It would query the ontology for friendly Units (both inside and outside the affected area) that Provide alternative PNT Capabilities (e.g., 'Inertial Navigation Systems', 'Celestial Navigation', 'Chip-Scale Atomic Clocks'). Based on this, the agent could generate a set of potential COAs, such as:
   * **COA 1 (Re-tasking):** "Propose re-tasking of Unit X, which possesses advanced INS capabilities, to support the at-risk missions."
   * **COA 2 (Technology Insertion):** "Flag the at-risk Equipment types as high-priority candidates for upgrades with anti-jamming technology."
   * **COA 3 (Doctrinal Innovation):** "Identify a doctrinal gap in TTPs (Tactics, Techniques, and Procedures) for operations in a GPS-denied environment and propose the creation of a new EW\_Tactic."

This entire cycle—modeling doctrine, introducing a hypothetical threat, simulating its systemic impact, and using AI to generate data-driven mitigation strategies—represents the core of a truly dynamic innovation process. It is a strategic-level application of the OODA (Observe, Orient, Decide, Act) loop. The ontology serves as the "Observation" of the entire doctrinal landscape. The simulation is the "Orientation" to the new threat. The AI-generated COAs inform the "Decision" by human leadership. Finally, an **Action** in Foundry can kick off the "Act" phase, for example, by initiating a formal process to update a policy or fund a new technology program. This methodology allows the DoD to continuously stress-test its own operational logic against an evolving threat landscape, transforming doctrine from a reactive record of past lessons into a proactive tool for shaping future advantage.

## Section 5: Strategic Recommendations and Future Outlook

The methodology detailed in this report represents a fundamental shift in how the Department of Defense can manage, understand, and evolve its foundational principles. By transforming doctrine from static text into a dynamic, AI-ready semantic model, the DoD can unlock significant strategic advantages. This concluding section synthesizes the analysis into a set of actionable recommendations and provides a forward-looking perspective on the broader implications of this approach.

### 5.1 A Roadmap for an EMSO Doctrinal Innovation Cell

To translate this concept into reality, a focused, agile implementation is recommended over a large, bureaucratic program. The establishment of a dedicated, cross-functional **EMSO Doctrinal Innovation Cell** would provide the ideal environment to pilot and prove the value of this methodology. This cell should be comprised of a small team of EMSO subject matter experts, operational planners, and data scientists or forward-deployed engineers skilled in the Foundry platform.

A phased implementation plan is proposed:

* **Phase 1: Foundation (First 3 Months):** The cell's initial focus would be on ingesting the core corpus of Joint and Air Force EMSO-related documents (e.g., AFDP 3-85, JP 3-85). The primary goal is to build and validate the initial EMSO-specific ontology as outlined in Section 4. This phase would deliver a foundational, queryable model of current EMSO doctrine.
* **Phase 2: Expansion and Analysis (Months 4-9):** The cell would expand the scope of ingestion to include documents from adjacent, highly dependent domains such as Command and Control (C2), Cyber Operations, and Space Operations. With this enriched model, the team would begin conducting the initial gap analysis queries described in Section 4.3, identifying doctrinal seams, capability mismatches, and areas of ambiguity. The outputs would be a series of analytical reports delivered to relevant stakeholders in the Air Staff and Combatant Commands.
* **Phase 3: Proactive Innovation (Ongoing):** In this mature phase, the cell would integrate live or near-real-time intelligence feeds on adversary EMS capabilities and TTPs into the platform. This data would be used to drive the scenario modeling and wargaming workflows described in Section 4.4. The cell would transition to a proactive posture, continuously testing the resilience of U.S. doctrine against emerging threats and generating data-driven COAs for investment, training, and doctrinal updates. The cell becomes a permanent engine for strategic innovation in the EMSO domain.

### 5.2 Scaling the Doctrinal Ontology: Beyond EMSO

The true strategic value of the doctrinal ontology lies in its extensibility. The core model of units, personnel, missions, and policies is a reusable enterprise asset. Once established, the pattern of augmenting this core with domain-specific concepts can be rapidly applied to address other complex, multi-domain challenges facing the DoD. The deep and expanding contractual relationship between Palantir and the U.S. Army, including massive enterprise-level agreements to consolidate dozens of existing programs, indicates that the institutional appetite and infrastructure for such a scalable approach are already being established.

Potential areas for expansion include:

* **Joint All-Domain Command and Control (JADC2):** The ontology can be extended to model the specific command, control, and communications (C3) links between every sensor, decider, and shooter across all services. This would enable network analysis to identify critical nodes, single points of failure, and communication pathway vulnerabilities. Palantir's existing contracts with the Air Force and Space Force for C2 and data-as-a-service platforms point directly to this use case.
* **Contested Logistics:** The model can be augmented with data on global supply chains, transportation nodes, fuel and munitions stockpiles, and dependencies on commercial infrastructure. Planners could then simulate the impact of interdiction at various points in the logistics chain to assess its effect on force readiness and operational endurance.
* **Great Power Competition:** The methodology can be applied to the strategic and doctrinal documents of peer adversaries. By building an ontology of an adversary's way of war, U.S. strategists can better understand their decision-making calculus, anticipate their actions, and develop more effective countermeasures. This aligns with the use of AI to analyze vast data sets to predict enemy behavior.

### 5.3 The Future of Doctrine: From Static Text to Dynamic Strategy

The adoption of this methodology represents a paradigm shift in the nature and role of military doctrine. It moves doctrine from a static, archival function to a dynamic, operational one. When doctrine exists as a living, AI-ready model, it can be updated in near-real-time based on lessons learned from the battlefield, insights from intelligence, or the results of simulations, rather than waiting for a multi-year formal review cycle.

This creates a continuous, high-speed feedback loop between operations, intelligence, and doctrine. The way the military *fights* can constantly inform the way it *plans to fight*, and vice-versa. This ensures that the foundational logic of the force adapts at the same speed as the operational environment itself. By codifying its own rules into a computable format, the DoD is not simply creating a more efficient library; it is building an AI-ready foundation for future warfare. This approach provides a clear, actionable pathway to achieving true decision advantage and maintaining strategic superiority in the complex and fast-paced security environment of the 21st century.

#### Works cited

1. Palantir Foundry: Revolutionising Data Management in the Technology Industry, https://tauseef-feraz.medium.com/palantir-foundry-revolutionising-data-management-in-the-technology-industry-8531ff9f6f20 2. Palantir lands $480M Army contract for Maven artificial intelligence ..., https://defensescoop.com/2024/05/29/palantir-480-million-army-contract-maven-smart-system-artificial-intelligence/ 3. Palantir racks up more than $100M in new Air Force contract awards ..., https://defensescoop.com/2023/06/16/palantir-racks-up-more-than-100m-in-new-air-force-contract-awards-to-provide-data-as-a-service/ 4. Ontology Palantir - notes - follow the idea - Obsidian Publish, https://publish.obsidian.md/followtheidea/Content/AI/Ontology+Palantir+-+notes 5. Warfare at the Speed of Thought: Balancing AI and Critical Thinking for the Military Leaders of Tomorrow - Modern War Institute, https://mwi.westpoint.edu/warfare-at-the-speed-of-thought-balancing-ai-and-critical-thinking-for-the-military-leaders-of-tomorrow/ 6. From Strategy to Orders: Preparing and Conducting Military Operations with Artificial Intelligence - GCSP, https://www.gcsp.ch/sites/default/files/2025-02/military-operations-working-paper-v2.pdf 7. Run Palantir Foundry and Artificial Intelligence Platform on OCI - Oracle Help Center, https://docs.oracle.com/en/solutions/palantir-foundry-ai-platform-on-oci/index.html 8. Pipelines on unstructured data • Overview - Palantir, https://palantir.com/docs/foundry/building-pipelines/unstructured-overview/ 9. Overview • Data integration - Palantir, https://palantir.com/docs/foundry/data-integration/overview/ 10. Graph elements reference - Data Lineage - Palantir, https://palantir.com/docs/foundry/data-lineage/elements-reference/ 11. Knowledge Graph Extraction and Challenges - Graph Database & Analytics - Neo4j, https://neo4j.com/blog/developer/knowledge-graph-extraction-challenges/ 12. How To Build a Multi-Source Knowledge Graph Extractor from ..., https://medium.com/data-science-collective/how-to-build-a-multi-source-knowledge-graph-extractor-from-scratch-60f0a51e17b5 13. Automatic Building of an Ontology from a Corpus of Text Documents Using Data Mining Tools - ResearchGate, https://www.researchgate.net/publication/260777124\_Automatic\_Building\_of\_an\_Ontology\_from\_a\_Corpus\_of\_Text\_Documents\_Using\_Data\_Mining\_Tools 14. Automatic Building of an Ontology from a Corpus of Text Documents Using Data Mining Tools - SciELO México, https://www.scielo.org.mx/pdf/jart/v10n3/v10n3a9.pdf 15. A survey of ontology learning techniques and applications - PMC, https://pmc.ncbi.nlm.nih.gov/articles/PMC6173224/ 16. Ontology augmented generation - Semantic search - Palantir, https://palantir.com/docs/foundry/ontology/ontology-augmented-generation/ 17. Palantir Defense Solutions, https://www.palantir.com/offerings/defense/ 18. What Is Palantir? The Company Behind Government AI Tools | Built In, https://builtin.com/articles/what-is-palantir 19. Platform overview - Palantir, https://palantir.com/docs/foundry/platform-overview/overview/ 20. Ontology Learning from Text: An Overview - CiteSeerX, https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=96133e6f5d80c89d3ea31673dc9e467f63fd7366 21. An Overview of Ontology Learning Tasks - SciELO México, https://www.scielo.org.mx/scielo.php?script=sci\_arttext&pid=S1405-55462018000100137 22. Ontology Learning from Text: A Survey of Methods, https://www.inf.uni-hamburg.de/en/inst/ab/lt/publications/2005-biemannetal-ldvforum-ontology.pdf 23. Ontology Learning from Text: an Analysis on LLM ... - CEUR-WS.org, https://ceur-ws.org/Vol-3874/paper5.pdf 24. KGGen: Extracting Knowledge Graphs from Plain Text with Language Models - arXiv, https://arxiv.org/html/2502.09956v1 25. An Automatic Ontology Generation Framework with An Organizational Perspective - arXiv, https://arxiv.org/pdf/2201.05910 26. Palantir Foundry Ontology, https://www.palantir.com/explore/platforms/foundry/ontology/ 27. Foundational Ontologies in Palantir Foundry | by Dorian Smiley | Medium, https://dorians.medium.com/foundational-ontologies-in-palantir-foundry-a774dd996e3c 28. Palantir Foundry, https://www.palantir.com/platforms/foundry/ 29. Ontology architecture - Palantir, https://palantir.com/docs/foundry/object-backend/overview/ 30. Overview • Ontology • Palantir, https://palantir.com/docs/foundry/ontology/overview/ 31. Create Ontologies - Encord Docs, https://docs.encord.com/platform-documentation/Annotate/annotate-ontologies/annotate-create-ontologies 32. Ontology - - The Digital Archaeological Record, https://www.tdar.org/using-tdar/creating-and-editing-resources/ontology-create-and-edit/ 33. Code Workbook [Legacy] • Transforms • Access unstructured files - Palantir, https://palantir.com/docs/foundry/code-workbook/transforms-unstructured/ 34. Analysis • Graph mode - Quiver - Palantir, https://palantir.com/docs/foundry/quiver/analysis-graph/ 35. Artificial Intelligence in Command and Control Systems - GMV, https://www.gmv.com/en/node/213/printable/print 36. The Acceleration of Command and Control Through Artificial ... - Finabel, https://finabel.org/the-acceleration-of-command-and-control-through-artificial-intelligence-and-its-implications-for-european-land-forces/ 37. ELECTROMAGNETIC SPECTRUM OPERATIONS - Air Force Doctrine, https://www.doctrine.af.mil/Portals/61/documents/AFDP\_3-85/AFDP%203-85%20Electromagnetic%20Spectrum%20Ops.pdf 38. Modern Electromagnetic Spectrum Battlefield - NDU Press - National Defense University, https://ndupress.ndu.edu/Media/News/News-Article-View/Article/2846737/modern-electromagnetic-spectrum-battlefield/ 39. Electro Magnetic Spectrum Operation (EMSO) - emsopedia, https://www.emsopedia.org/entries/electro-magnetic-spectrum-operation-emso/ 40. Harnessing Decades of Electromagnetic Spectrum Operations Expertise, https://www.afcea.org/signal-media/defense-operations/harnessing-decades-electromagnetic-spectrum-operations-expertise 41. Palantir's AI-Driven Government and Commercial Growth: Why This Is a Must-Hold for the AI-First Era - AInvest, https://www.ainvest.com/news/palantir-ai-driven-government-commercial-growth-hold-ai-era-2507/ 42. AI's New Frontier in War Planning: How AI Agents Can ..., https://www.belfercenter.org/research-analysis/ais-new-frontier-war-planning-how-ai-agents-can-revolutionize-military-decision 43. Contracts for May 21, 2025 - Department of Defense, https://www.defense.gov/News/Contracts/Contract/Article/4194643/ 44. Army consolidates dozens of Palantir software contracts into one deal worth up to $10 billion, https://breakingdefense.com/2025/08/army-consolidates-dozens-of-palantir-software-contracts-into-one-deal-worth-up-to-10-billion/ 45. Army Awards Palantir Potential $10B Agreement for Commercial Software - GovCon Wire, https://www.govconwire.com/articles/palantir-army-enterprise-agreement-commercial-software-leo-garciga 46. Palantir Gets US Army Contract Worth Up to $10B - The Defense Post, https://thedefensepost.com/2025/08/02/palantir-us-army-contract/ 47. Navigating the AI battlefield: Opportunities and ethical frontiers - NRDC Italy, https://nrdc-ita.nato.int/newsroom/insights/navigating-the-ai-battlefield-opportunities--challenges--and-ethical-frontiers-in-modern-warfare 48. Air Force Doctrine Note 25-1, Artificial Intelligence (AI), https://www.doctrine.af.mil/Portals/61/documents/AFDN\_25-1/AFDN%2025-1%20Artificial%20Intelligence.pdf 49. An AI Revolution in Military Affairs? How Artificial Intelligence Could ..., https://www.rand.org/pubs/working\_papers/WRA4004-1.html