

BOOK PROSPECTUS

Governed Propulsion

From Plume Augmentation to Field-Coupled Flight

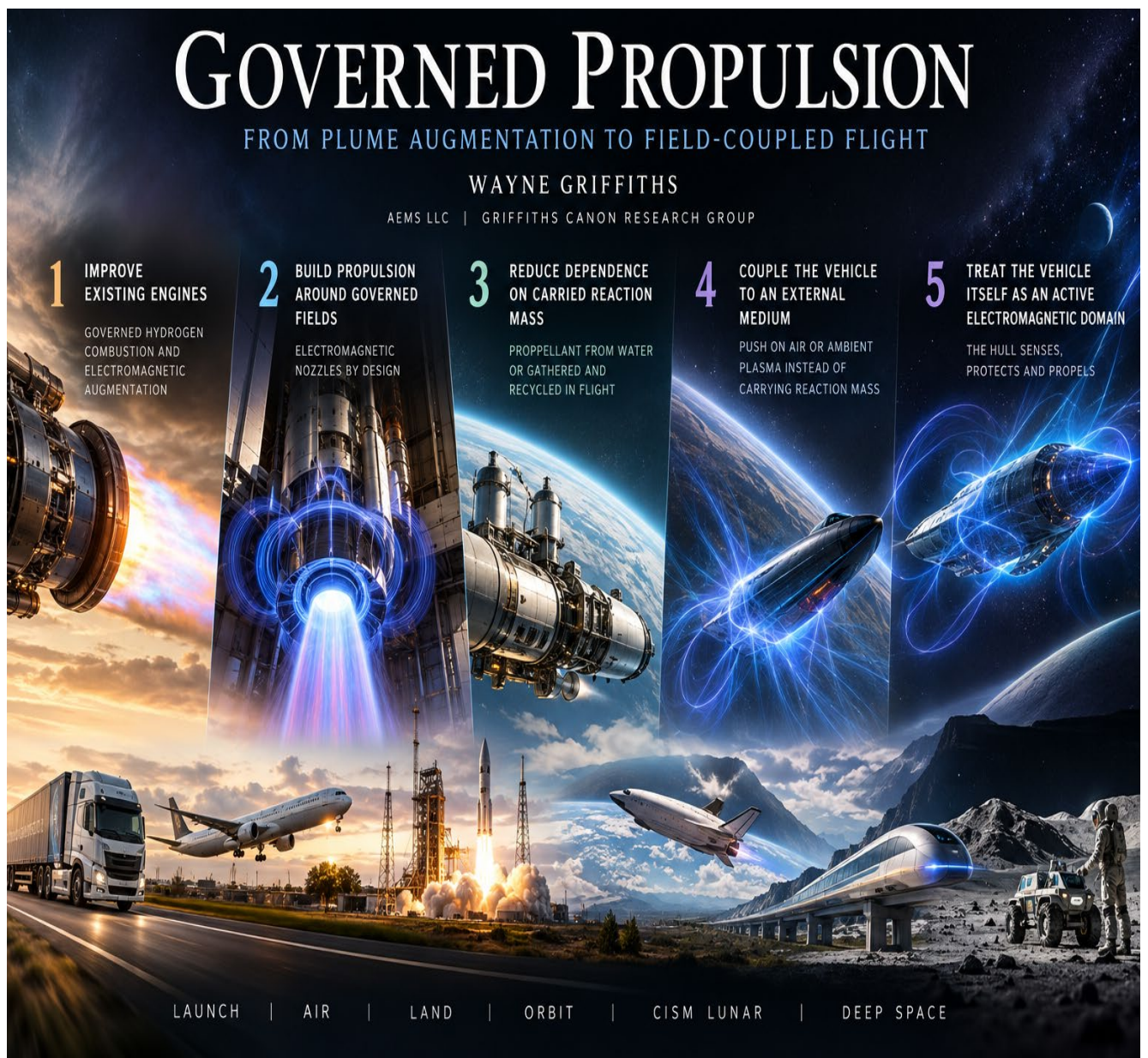
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The third book of the Griffiths Canon, following The Governed Field and The Managed Plasma Environment



The Canon at a Glance

Governed Propulsion presents a common engineering framework that connects propulsion systems operating at radically different scales and with radically different momentum sources.

Every architecture below is currently at the on-paper level: architecture, governing relations and analytical projections are defined in its source paper. The third column gives the next evidence level each one requires. The fourth shows the point of the book: the same few components recur across very different engines.

Engine	Momentum source	Next evidence level	Shared components
H2EM Land Engine	Road, via wheels	Testable now: combustion bench	H2EM, DIGSP
H2EM Aero Engine	Air, via propeller	Testable now: combustion bench	H2EM (ammonia cracking), DIGSP
H2EM Jet Turbine	Air, via turbine exhaust	Testable now: kernel bench	H2EM reaction kernel, DIGSP
EM Augmentation Collar	Host engine exhaust	Testable now: existing thruster	REMN, DIGSP, REBCO
REMN+ MHD Skirt	Host engine exhaust	Sub-scale: seeded hot-fire	REMN rings
GSB-REMN Snapback	Host engine exhaust	Testable now: thrust stand	Snapback, REBCO, DIGSP, GTRU
GREMN	Onboard propellant	Testable now: Phase 1 test matrix	REMN, outer envelope, REBCO, Snapback, DIGSP
G-REMN-CRX-4R	Onboard propellant	Sub-scale: ground test	REMN, CRX, REBCO, Snapback
H2EM Thruster	Onboard water	Sub-scale: ground demonstrator	H2EM, REMN, Snapback, REBCO, GTRU, DIGSP
H2EM-Field	Onboard water	Space environment	H2EM, CRX, REBCO, outer envelope, Snapback, DIGSP
GNMT	Onboard water	Space environment	REMN+, REBCO, H2EM, DIGSP
Methane-Steam Hybrid Drive	Onboard and gathered propellant	Space environment	Microwave cracking, DIGSP
ORFE Engine	Ambient charged medium	Plasma chamber	ORFE, REMN, CRX, FCEMD, Snapback, GTRU, DIGSP
FCEMD vehicle family	Ambient charged medium	Plasma chamber	FCEMD, REMN+, CRX-4R, GTRU, DIGSP
ECEPC	Air or ambient plasma	Testable now: Stage 0 lift-off	REMN, GREMN, ORFE, GTRU, DIGSP
Active Hull	Air or ambient plasma	Sub-scale demonstrator	REMN, GREMN, ORFE, GTRU, DIGSP
GEM Maglev	Rail	Testable now: bench demonstrator	GTRU, H2EM reactor option
NGLS	Onboard cold gas	Sub-scale demonstrator	Cold-gas 6DOF; Canon autonomy integration

Table 0. The Canon at a glance.

Executive Overview

This overview is written for a reader meeting the Griffiths Canon for the first time. Each idea is introduced in plain language before its technical name. A one-page table of key terms follows.

What the book is about

Every vehicle moves by pushing on something. A rocket pushes on the gas it throws out of its nozzle. A jet engine pushes on the air it swallows and accelerates. A train pushes on its rails. The question behind every propulsion system is the same: where does the push come from, and how well is it controlled?

This book shows how one idea, electromagnetic governance, applies across the whole range of answers. Governance means shaping and holding a flow of hot, electrically charged gas with magnetic and electric fields that are measured and corrected continuously, rather than with fixed metal walls alone. The book follows that idea from its simplest uses, converting a car, aircraft or jet engine to governed hydrogen and tidying the exhaust of a rocket that already flies, to its most ambitious, craft that push on the thin charged gas of space itself and carry no propellant for that purpose.

The progression

The book tells one story in five stages, each taking a step further from conventional propulsion:

Stage	What changes	Where in the book
1. Improve propulsion that already exists	Governed hydrogen combustion converts engines that already run; electromagnetic modules shape the exhaust of engines that already fly	Part II: H2EM Land Engine, Aero Engine, Jet Turbine; Augmentation Collar, MHD Skirt, Snapback
2. Build propulsion around governed fields	The engine is designed from the start around a governed electromagnetic nozzle	Part III: GREMN, CRX-4R, H2EM Thruster, H2EM-Field, GNMT
3. Reduce dependence on carried reaction mass	Propellant made from water or gathered and recycled in flight rather than launched in full	Part III: H2EM water-to-hydrogen systems, Methane-Steam Hybrid Drive
4. Couple the vehicle to an external medium	The craft pushes on air or ambient plasma instead of its own exhaust	Part IV (External-Medium Propulsion): ORFE, FCEMD vehicle family, ECEPC
5. Treat the vehicle itself as an active electromagnetic domain	The hull becomes the field boundary through which the craft senses, protects and propels	Part IV (External-Medium Propulsion): Active Hull

Table E1. The five-stage progression.

Surface and EVA mobility (governed maglev and the NGLS logistics sled) apply the same method to vehicles that push on rails and structures. The closing part of the book then asks, for every stage, what exists only on paper and what can be tested now.

The organising principle

Every push must be accounted for by the momentum given to something else.

This single rule runs through the whole book. For every engine the first question is not how clever it is, but what it pushes against: its own exhaust, the air, the charged gas of space, or a rail. Answer that, measure it, and the engine can be judged on the same terms as any rocket or jet ever built.

Three places to get a push

The book organises every engine in the Canon by where its push comes from:

Momentum source	Plain meaning	Engines in the book
Existing engines, improved	Take an engine that already works (a car or aircraft engine, a jet turbine, a rocket or ion thruster) and either convert its combustion to governed hydrogen or shape its exhaust electromagnetically	H2EM Land Engine, Aero Engine and Jet Turbine; EM Augmentation Collar, REMN+ MHD Skirt, GSB-REMN Snapback
Onboard propellant, governed	Carry propellant (usually water, hydrogen or methane) and accelerate it through a governed electromagnetic nozzle	GREMN, G-REMN-CRX-4R, H2EM Thruster, H2EM-Field, GNMT, Methane-Steam Hybrid Drive
The outside medium	Take hold of the air, or the charged gas of space, and push it backwards, so the craft does not have to carry its own reaction mass	ORFE engine, FCEMD vehicle family, ECEPC, Active Hull
A surface or a structure	Push against rails or a spacecraft structure	GEM Maglev, NGLS EVA logistics sled

Table E2. The propulsion family by momentum source.

Reading the family this way makes the trade-offs visible. Carrying propellant limits how far a craft can go. Using the outside medium removes that limit but depends on the medium being there and dense enough. Improving an existing engine is the nearest to flight, because the engine already exists.

What is measured, and what counts as success or failure

Because the later engines in the book are the least familiar, the book sets out its test culture first, before any engine is described. Every engine is judged on the same measured quantities:

Measured	Why it matters
Force on the vehicle or test stand	The push itself, measured directly
Mass flow and velocity of what is pushed	The momentum given to the exhaust, the air or the ambient plasma; it must account for the force
Electrical power delivered	What the push costs
Field, current and plasma state	Evidence that the governed field, not something else, is doing the work
Governed against ungoverned runs	The same engine with governance on and off; the difference is the contribution of governance

Table E3. The common measurement record.

Success means a force that is repeatable, that matches the momentum carried away by the measured reaction mass within stated uncertainty, and that changes when governance is switched on. Failure means no force, a force that the measured momentum flux does not account for (which points to a measurement error, never to new physics), or no difference between governed and ungoverned runs. Each source paper states its own gates and kill conditions in these terms, and the book collects them.

The common toolkit

The engines look very different, but they are built from the same small set of electromagnetic building blocks. This reuse is the real substance of the Canon: it is one field-governance architecture applied repeatedly, not a collection of unrelated machines. A component proved on one engine is proved for every engine that uses it, and learning the blocks once lets a reader follow every chapter:

Building block	What it does, in plain terms
REMNI / GREMNI (rotating electromagnetic nozzle)	A ring of rotating magnetic field around the exhaust that spins, squeezes and accelerates it, acting as a nozzle made of field rather than metal
Outer rotating-field envelope (ORFE)	A larger field layer around the inner nozzle that sets its outer boundary and keeps the exhaust from spreading
CRX throat	The narrowest point of the flow, where the field is strongest and the flow is held steady
REBCO insert	A small, very strong superconducting magnet placed at the throat to stiffen the flow where it is most likely to go unstable
Snapback	A burst of stored magnetic energy released into the exhaust, or a controlled return to a safe state when something goes wrong
DIGSP	The control system that measures the flow and adjusts every field thousands of times a second
GTRU / GRTU	The long-life power and heat source that runs the fields for years without solar panels

Table E4. The shared electromagnetic building blocks.

An example of the method

The book insists on one test for every engine: the push delivered must be accounted for by the momentum given to something else. The ECEPC terrestrial craft shows how. To hover with a force of 980.7 N (the weight of a 100 kg craft), it takes in about 96 kg of air every second and speeds it up by about 10 m/s. The ideal power needed for that is about 5 kW. Every number in the chain can be measured on a test stand, which is what makes the claim testable rather than rhetorical.

The family roadmap

Each paper defines its own staged validation programme. The book assembles them into one roadmap in three stages: bench and test stand, sub-scale engine and chamber plasma, and relevant environment and flight. The roadmap shows which bench result unlocks which later engine, which engines share test hardware, and which articles are nearest to hardware. The hydrogen combustion bench, the augmentation modules, the GREMNI test matrix and the maglev bench demonstrator can be tested with conventional laboratory equipment; the external-medium craft need chamber plasma first and space-relevant plasma later.

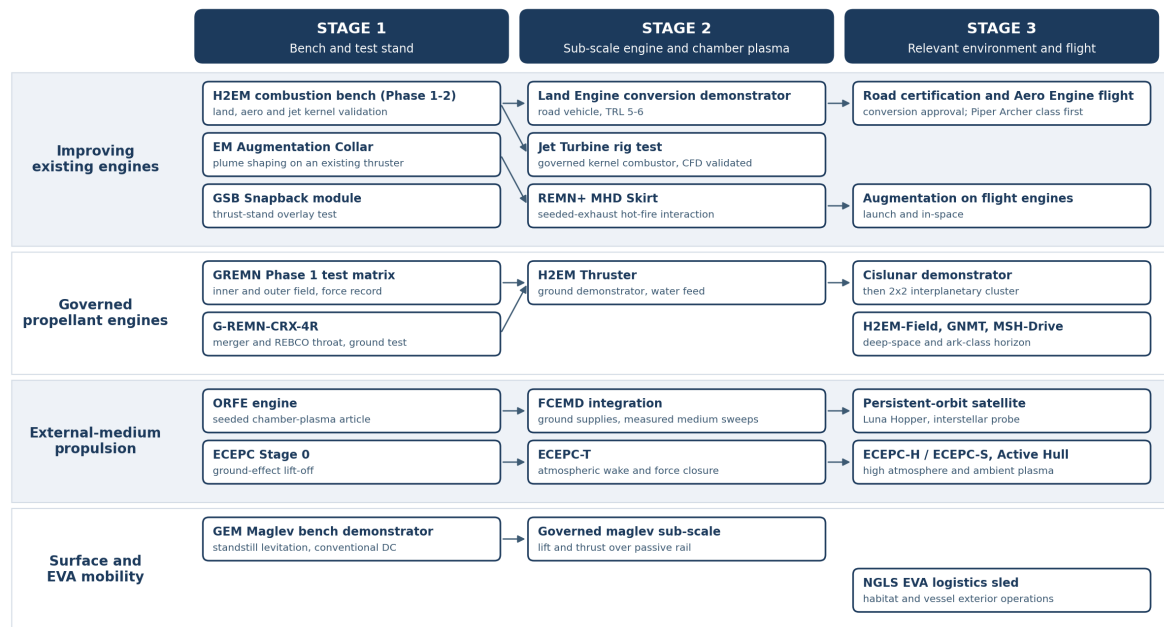


Figure E1. The Governed Propulsion family roadmap.

The closing part of the book places every engine on the same evidence ladder, so the reader finishes knowing exactly where each one stands:

Evidence level	Meaning
On paper	Architecture, governing relations and analytical projections defined
Testable now	A bench or test-stand measurement is possible with existing equipment
Sub-scale demonstrator	Needs a purpose-built reduced-scale engine or vehicle
Plasma-chamber test	Needs a controlled plasma environment standing in for space
Space-environment validation	Can only be settled in orbit, in the high atmosphere or on a planetary surface
Open physics question	An unresolved point, stated with the measurement that would close it

Table E6. The evidence ladder used in the closing part.

Why it matters

Propulsion development is split into separate communities: launch engines, electric thrusters, nuclear propulsion, atmospheric flight and ground transport. Each develops its own control methods. The Canon offers one governance language across all of them, so that a result proved on one engine informs the rest. For agencies, primes and investors, the book gives a single map of a large body of work and a clear view of which pieces are closest to test.

How the book relates to the earlier books

The Governed Field sets out the general worldview: that electromagnetic fields can be engineered and governed as deliberately as any other machine element. The Managed Plasma Environment turned that worldview into an operational discipline for plasma. Governed Propulsion applies both to the task of moving vehicles, and is the most application-facing book of the three.

Key Terms

Each term is defined in full where it first appears in the book; this table gives the plain meaning.

Term	Plain-language meaning
Thrust	The push an engine produces, measured in newtons (N)
Exhaust velocity and specific impulse (Isp)	How fast the exhaust leaves the engine; higher means less propellant used for the same total push
Reaction mass	The material an engine pushes backwards to move forwards; carried onboard or taken from outside
Plume	The stream of exhaust leaving an engine
Plasma	Gas hot or energised enough to conduct electricity and respond to magnetic fields
Magnetic nozzle	A nozzle formed by magnetic field instead of solid walls
Governance	Continuous measurement and correction of a flow by electromagnetic fields
REMNI, GREMI	Rotating electromagnetic nozzle, and the Griffiths analytical framework for it
ORFE	Outer rotating-field envelope: the outer field layer around the inner nozzle
CRX / CRX-4R	The governed throat; CRX-4R is the four-ring counter-rotating version
REBCO	High-temperature superconducting tape used for compact, very strong magnets
Snapback (GSB)	Stored magnetic energy released into the plume, or a controlled return to a safe state
DIGSP	The layered control system that senses, schedules and protects the engine
GTRU / GRTU	Governed radioisotope power and thermal unit supplying long-life power
H2EM	Hydrogen electromagnetic: hydrogen made on demand (often from water) and burned or ionised under field control
FCMD	Field-coupled electromagnetic drive: the core of the vehicles that push on ambient plasma
ECEPC	Externally coupled electromagnetic propulsion craft: pushes on air or ambient plasma
MHD	Magnetohydrodynamics: the physics of electrically conducting fluids moving in magnetic fields
Ammonia cracking	Splitting ammonia into hydrogen and nitrogen on board as it is needed, so no hydrogen is stored
Governed reaction kernel	A combustion zone held in place by electromagnetic field rather than by a flameholder or swirl

Table E5. Key terms.

What This Book Does Not Claim

A book about unfamiliar propulsion should say plainly what it is not saying. The book carries this page near its front, and repeats it in its closing chapter.

- It does not claim any violation of conservation of momentum. Every engine in the book pushes on something identifiable: its own exhaust, the outside air or plasma, or a surface.
- It does not replace or modify Maxwell's equations or established plasma physics. The engines use Lorentz forces, induction, magnetohydrodynamics and magnetic-nozzle physics that are already in the textbooks.
- It does not claim experimental validation where none has yet occurred. Performance figures are reported as the source papers state them: analytical projections and design targets unless explicitly identified as measured.
- It does not claim that external-medium craft work in every environment. Their performance depends on the measured density and conductivity of the medium, and each operating regime is qualified separately.
- It does not provide build-level hardware detail. That remains in the source papers and internal engineering documents.
- It presents architectures, governing relations and validation pathways. Hardware will decide the rest.

1. The Book in One Paragraph

Governed Propulsion presents a common engineering framework that connects propulsion systems operating at radically different scales and with radically different momentum sources. It treats the Griffiths Canon propulsion family as one engineering programme. Eighteen source papers, covering governed hydrogen conversions of road, piston-aircraft and jet-turbine engines, plume augmentation modules for existing engines, governed electromagnetic nozzles, water- and hydrogen-fed deep-space thrusters, nuclear microwave-thermal propulsion, an ark-class regenerative drive, craft that couple to the outside medium, a governed maglev and an EVA logistics sled, are organised as a five-stage progression and by where each engine gets its push and built from a shared set of field components under one control architecture (DIGSP). The book explains the method and the architecture of each engine, gathers every validation programme into a single roadmap, and leaves build-level hardware detail to the source papers.

2. The Problem the Book Addresses

The Canon propulsion work has grown into a large body of papers, each written to stand alone. A reader who meets one paper cannot easily see how it relates to the rest: which components are shared, which engine is the precursor of which, and where the whole family is heading. The book provides that map, and in doing so turns a collection of engines into a coherent programme with a common vocabulary, common physics and a common test logic.

3. What Makes It Distinctive

- Momentum accounting as the organising principle: every push accounted for by the momentum given to something else, stated before any engine is described.
- Validation culture first: what is measured, what counts as success and what counts as failure are set out in Chapter 3, before the less familiar engines appear.
- One classification for the whole family: every engine placed by its momentum source, from improved exhaust to the outside medium.
- One toolkit: a small set of field building blocks (REMN, ORFE, CRX, REBCO, Snapback, DIGSP, GTRU) reused across launch, deep-space, atmospheric and ground vehicles.
- A single validation roadmap and evidence ladder, expanded into a closing part of three chapters, that states for every engine what exists on paper, what can be tested now and what remains an open physics question.
- An explicit statement of what the book does not claim.
- Method, not hardware: the book explains architecture and governing relations; build-level detail stays in the papers and internal documents.

4. Audience

Reader	What they take from the book	Entry point
Propulsion engineers (chemical, electric, nuclear)	How field governance attaches to engines they already know, and what it changes	Parts II and III
Aviation and automotive engineers	Governed hydrogen conversion of piston, turbine and road engines without onboard hydrogen storage	Chapters 5 to 7
Space agencies and prime contractors	A map of near-term augmentation modules and longer-term governed engines, with their test paths	Chapter 0, Part VI

Mission architects	Which engine class suits which mission: launch, cislunar, outer planets, interstellar, atmospheric	Parts III and IV
Plasma and electric propulsion researchers	Shared field components and open questions suitable for collaboration	Chapters 3, 4, 11, 17
Investors and programme managers	Where the family stands and which article is nearest to hardware	Chapter 0, Chapters 23 and 24
Transport and mobility engineers	Governed road-engine conversion, governed maglev and EVA logistics as surface applications of the same method	Chapter 5, Part V

Table 1. Target readership.

5. Specifications

Item	Detail
Title	Governed Propulsion: From Plume Augmentation to Field-Coupled Flight (working title)
Author	Wayne Griffiths
Status	In preparation; source papers complete
Planned length	Approximately 115 to 135 pages; 26 chapters (including Chapter 0) in six parts; five appendices
Source base	18 Canon propulsion papers (listed in Section 7)
Series	Griffiths Canon, Book 3
Format	Digital edition via the AEMS website, as for the earlier Canon books
Style	Navy scheme consistent with the Canon book series; hero image and figures drawn from the source papers

Table 2. Book specifications.

6. Contents and Chapter Summaries

Part	Chapter	Summary
	0 Executive Summary	The family, the governing framework, the validation roadmap and the evidence status of each propulsion class
I Foundations	1 The Propulsion Problem	What limits today's engines and what governance adds
	2 Where the Push Comes From	Momentum sources, momentum accounting and the family classification
	3 Measurement and Validation	What is measured, what counts as success and failure, and how gates are set
	4 The Common Field Toolkit	REMNI, ORFE, CRX, REBCO, Snapback, DIGSP and the GTRU power spine
II Improving Existing Engines	5 The H2EM Land Engine	Governed hydrogen conversion of road and heavy-duty internal combustion engines
	6 The H2EM Aero Engine	Ammonia-cracking hydrogen retrofit for piston-propeller aircraft
	7 The H2EM Jet Turbine	Field-governed reaction kernel replacing the swirl-stabilised combustor

	8 The EM Augmentation Collar	Plume shaping for ion, Hall, chemical and thermal engines
	9 The REMN+ MHD Skirt	Boundary-layer governance for launch-class methalox engines
	10 GSB-REMN Snapback Augmentation	Pulsed magnetic relaxation delivered into the plume downstream of the nozzle
III Governed Propellant Engines	11 GREMN	The rotating electromagnetic nozzle framework and its outer field envelope
	12 G-REMN-CRX-4R	Four-ring counter-rotating staged architecture with REBCO throat
	13 The H2EM Thruster	Water-fed cislunar demonstrator and 2x2 interplanetary cluster
	14 H2EM-Field	Space-built water-to-hydrogen deep-space propulsion with external field envelope
	15 GNMT	Nuclear microwave-thermal propulsion with REMN+ REBCO inserts
	16 The Methane-Steam Hybrid Drive	Regenerative propulsion for ark-class interstellar missions
IV External-Medium Propulsion	17 The ORFE Engine	Accelerating an ambient charged medium through nested rotating fields
	18 The FCEMD Vehicle Family	Persistent-orbit satellites, debris collectors, Luna Hoppers, interstellar probes
	19 ECEPC	Externally coupled craft for terrestrial, high-atmosphere and space media
	20 The Active Hull	The vehicle as a governed electromagnetic domain
V Surface and EVA Mobility	21 GEM Maglev	Vehicle-generated lift and thrust over passive rails
	22 NGLS	Free-flying EVA logistics sled for heavy payloads
VI The Roadmap	23 The Family Roadmap	Every engine placed on the evidence ladder: on paper, testable now, sub-scale, plasma chamber, space environment
	24 First Hardware Articles and Shared Test Infrastructure	The articles nearest to hardware, what each measures, and the test equipment the family shares
	25 Open Questions, Claims and Non-Claims	The unresolved physics questions with the measurement that closes each, and what the family does and does not claim
Appendices	A to E	Paper index and publication record; gate register; Canon cross-reference; source classification; glossary

Table 3. Planned contents.

7. Source Papers

Paper	Chapter
H2EM Land Engine (ICE conversion) v2.3	5
H2EM Aero Engine V1.4	6

H2EM Jet Turbine v3.4 (Zenodo)	7
EM Augmentation Collar v4.0 (Acceleron Aerospace Journal, Vol. 6, No. 3)	8
REM+ MHD Skirt v5.0	9
GSB-REM AM v18	10
GREMN v28 (Zenodo)	4, 11
G-REM-CRX-4R v15	12
Unified H2EM Thruster, REMN, Snapback, Baffle and GTRU Architecture V12	13
H2EM-Field Propulsion v18	14
GNMT v16 (first published as v7.0, Acceleron Aerospace Journal, Vol. 6, No. 2)	15
Griffiths Methane-Steam Hybrid Drive v4.0	16
ORFE Particle Accelerator Engine v6	17
Persistent-Orbit Satellites, Debris-Collector Craft, Luna Hoppers and Interstellar Probes v22.0	18
ECEPC v4	19
Active Hull Governed Electromagnetic Domain Architecture v7	20
GEM Maglev v8.0	21
NGLS v5.0 (Acceleron Aerospace Journal, Vol. 6, No. 2)	22

Table 4. Source papers.

8. Place in the Griffiths Canon

Book	Role
The Governed Field	The worldview: electromagnetic fields as governed engineering domains
The Managed Plasma Environment	The operational doctrine for governed plasma
Governed Propulsion (this book)	The application to moving vehicles, from launch to interstellar and ground transport

Table 5. The Canon book series.

9. Comparable Titles

The book is positioned as a unified treatment of launch engines, electric thrusters, nuclear propulsion, external-medium craft and ground transport through a common electromagnetic governance architecture. It sits alongside the standard references:

Title	Author, publisher	Relationship
Rocket Propulsion Elements	G. P. Sutton and O. Biblarz, Wiley	Standard chemical and general propulsion reference
Fundamentals of Electric Propulsion	D. M. Goebel and I. Katz, Wiley	Ion and Hall thruster reference; basis for the augmentation chapters
Physics of Electric Propulsion	R. G. Jahn, McGraw-Hill (Dover reprint)	Classic treatment of electromagnetic acceleration
Space Propulsion Analysis and Design	R. W. Humble, G. N. Henry and W. J. Larson, McGraw-Hill	Mission-level propulsion selection

The Starflight Handbook	E. Mallove and G. Matloff, Wiley	Survey of interstellar propulsion concepts
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Table 6. Comparable titles.

10. About the Author

Wayne Griffiths is the founder and President of AEMS LLC (Advanced EM Systems LLC) and leads the Griffiths Canon Research Group in Auckland, New Zealand. He is a self-funded independent inventor and researcher whose Griffiths Canon spans electromagnetic field governance, plasma physics, radioisotope power systems, industrial processing and aerospace architecture. His propulsion papers have appeared in the Acceleron Aerospace Journal and on Zenodo, and he is the author of The Governed Field and The Managed Plasma Environment.