

Corona

Corkscrew MHD Accelerator · Defense & Aerospace Platform

Σ MECHANISM HydroSynth DBD	MODES 3 + retrofit	AURORA PRICING \$20-340 M	DEFENSE MARGIN 50-60 %
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Defense Aerospace Platform with Corkscrew MHD Acceleration

HydroSynth DBD plasma · Corkscrew geometry · 2028 MCIB v9 validation gates volume production

A1 Corona is Aurora's defense/aerospace platform: a Corkscrew MHD accelerator using HydroSynth dielectric barrier discharge (DBD) for plasma σ generation. A1 spans four configurations across air, ground, and aerial mission profiles — from PPAC single-use strike systems to advanced ISR/EW UAVs to aircraft-class multi-mission platforms. The 2028 MCIB v9 validation milestone is the single most important commercial gate in Aurora's portfolio: it unlocks volume production at 70% retrofit cost reduction.

WHY A1 CORONA

A1 is the primary commercial value driver in Aurora's portfolio, with defense margins (50-60%) materially higher than commercial energy (32-35%). DoD program-of-record decisions and DARPA/AFRL early-adoption programs in 2026-2028 will determine A1 deployment scale. The Corkscrew geometry + HydroSynth DBD σ mechanism is patented and represents a fundamental advance over heritage MHD accelerators — sidestepping the seeded-combustion plasma failure mode while delivering thrust and power densities that enable mission profiles unreachable with conventional propulsion.

A1 Configurations

<p>MODE A · PPAC</p> <p>Single-Use Strike</p> <p>\$70-95M (\$80M mid)</p> <p>Pulsed plasma armament cluster · 2026-2028 deployment · single-use strike platform · DARPA/AFRL near-term programs</p>	<p>MODE A · MCIB V9</p> <p>Volume Retrofit</p> <p>\$20-30M (\$25M mid)</p> <p>Post-2028 volume deployment · 70% cost reduction via MCIB v9 retrofit · the gating event for A1 commercial scale</p>	<p>MODE B</p> <p>ISR/EW UAV</p> <p>\$55-75M (\$65M mid)</p> <p>Advanced ISR/EW UAV class · 1× A3 plasma toroid component · multi-mission reconnaissance, electronic warfare</p>	<p>MODE C</p> <p>Multi-Mission Aircraft</p> <p>\$300-380M (\$340M mid)</p> <p>Aircraft-class advanced multi-mission platform · 9× A3 plasma toroid array · strategic ISR/strike combination</p>
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HERITAGE SIDESTEP — THE Σ INNOVATION

A1 sidesteps the heritage Faraday MHD failure mode through HydroSynth DBD plasma generation:

- ✓ **HydroSynth DBD plasma σ source** — dielectric barrier discharge generates $\sigma \approx 200$ S/m via H_3O^+ ions at $n_e \approx 2.5 \times 10^{19} \text{ m}^{-3}$, dramatically higher than heritage alkali-seeded combustion
- ✓ **Corkscrew geometry** — proprietary helical channel topology optimizes Lorentz force coupling for thrust and power generation
- ✓ **No seeded combustion** — DBD chemistry sidesteps the 1989-1993 DOE Faraday MHD failure mode of slag-fouled electrodes
- ✓ **Modular A3 integration** — Mode B/C use A3 Cirrus plasma toroids as components, sharing platform technology across architectures

TARGET BUYERS · TODAY

US Department of Defense (DoD program-of-record acquisition) · DARPA / AFRL / Navy ONR (technology demonstration programs) · Defense primes (Lockheed Martin, RTX, Northrop Grumman) for integration · Allied defense ministries (5-Eyes, NATO Tier 1) · Foreign Military Sales (FMS) post-MCIB v9.

σ Mechanism & Plasma Specifications

σ generation mechanism	HydroSynth DBD	Dielectric barrier discharge in atmospheric H ₂ O-rich propellant · NOT seeded combustion
Plasma density (n _e)	2.5×10 ¹⁹ m ⁻³	Sustained operational target · 4-5× higher than heritage MHD
Conductivity (σ)	~200 S/m	Dominated by H ₃ O ⁺ ions · much higher than alkali-seeded combustion (A4) but lower than dissolved alkali in SC-NH ₃ (A2)
DBD electrode design	30 kV / 50 kHz	DI-A1-001 active discovery · pulsed barrier discharge · proprietary geometry
Working fluid (Mode A)	Air / N ₂ -O ₂ + H ₂ O	Atmospheric propellant · no fuel storage required for short-duration missions
Channel topology	Corkscrew (helical)	Proprietary geometry · optimized J×B coupling · patent pending

Mode-Specific Performance

MODE	OUTPUT / MISSION	CONFIGURATION
Mode A · PPAC	Pulsed plasma armament	Single-use strike platform · pulsed-power configuration · short-duration high-density plasma
Mode A · MCIB v9	Same envelope, 70% cost	Same operational envelope as PPAC · MCIB v9 manufacturing retrofit reduces unit cost · post-2028 volume deployment
Mode B	ISR/EW UAV propulsion	1× A3 plasma toroid (2.89 MWe) integrated · sustained operation · multi-mission profile
Mode C	Aircraft-class platform	9× A3 plasma toroid array (26 MWe total) · sustained high-power operations · strategic mission profiles

Platform Integration

A3 Cirrus integration (Mode B)	1× plasma toroid	A3 sold to A1 program at \$16M each (vs \$23M standalone) · 100% cross-architecture share for power module
A3 Cirrus integration (Mode C)	9× plasma toroid array	9-element redundant array · graceful degradation · mission survivability
Cross-architecture controllers	CS-CTRL family	Shared with A4 (CS-CTRL) and A3 (HydroSynth-CTRL) · platform-level commonality
Aurora NeuroControl (defense-rated)	MIL-STD-461 / 810	Hardened AI/ML plasma control · transferred from tokamak fusion · adaptive mission profile
Working-fluid handling commonality	Lowest cross-arch reuse	Each architecture has distinct fluid (gas-Brayton N ₂ +Cs vs SC-NH ₃ +alkali vs atmospheric air+H ₂ O vs stationary plasma)

Classification & ITAR Note: Detailed performance specifications for Mode A PPAC, Mode B, and Mode C configurations are classified at customer-specific levels. Performance data, mission profiles, electromagnetic signatures, and target effects parameters are available only under NDA + appropriate security clearance. ITAR-controlled technology · USML Categories I, IV, VIII, XI · export-controlled.

2028 MCIB v9 Validation — The Gating Event

The single most important commercial gate in Aurora's portfolio is **MCIB v9 validation in 2028**. This milestone unlocks Mode A volume production at 70% cost reduction (PPAC \$80M → MCIB v9 \$25M per unit). MCIB v9 represents the manufacturing-cost-improvement-block-9 retrofit that reduces unit cost through:

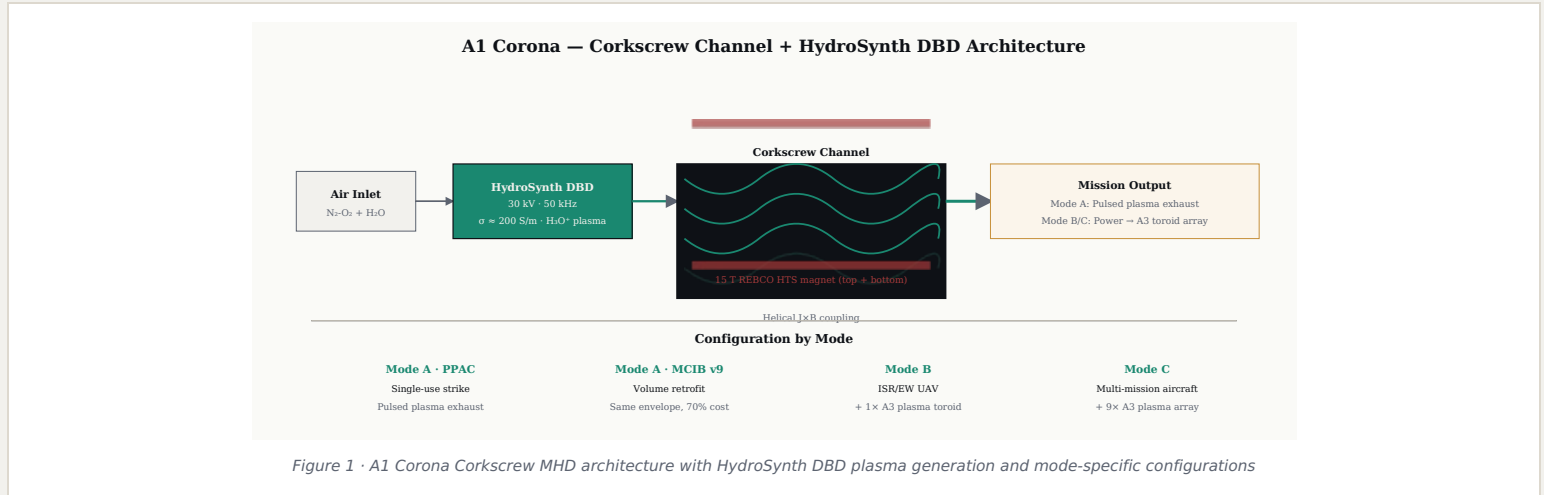
- Aurora-internal vertical integration of HTS magnet sourcing (10× cost reduction at volume)
- HydroSynth DBD electrode automated assembly via Stage 4 manufacturing line
- Corkscrew channel additive manufacturing (refractory metals, complex geometry)
- Aurora NeuroControl unified across modes (vs separate dev for each mode)

Critical Risk: A1 commercial scale depends on MCIB v9 validation success. Aurora's Plan §07 assigns 12% probability to S2 Defense scenario where MCIB v9 timeline slips and DoD adopts conservative procurement. Plan §02 supply chain identifies HTS magnet sourcing and refractory AM capability as MCIB v9-critical items requiring supplier consolidation.

How It Works

Operating Principle — Corkscrew MHD Acceleration

A1 uses Corkscrew MHD acceleration to convert electromagnetic energy into directed plasma momentum (Mode A) or extract electrical energy from accelerated plasma flow (Mode B/C as integrated power module). The defining innovation is the **helical channel geometry** coupled with HydroSynth DBD plasma generation, which together optimize Lorentz force coupling at conductivities and densities far exceeding heritage MHD platforms.



Subsystem Architecture

A1-01 · HydroSynth DBD Plasma	σ source	Dielectric barrier discharge at 30 kV / 50 kHz · proprietary electrode geometry · DI-A1-001 active discovery
A1-02 · Corkscrew Channel	Helical Faraday topology	Proprietary helical geometry · refractory metals · additive manufacturing for complex profiles · patent pending
A1-03 · HTS Magnet	15 T REBCO	Conduction-cooled · top + bottom configuration around helical channel · enables compact mission packaging
A1-04 · A3 Integration (Mode B/C)	1× or 9× A3 toroids	Plasma toroid array provides mission power · shared platform technology with A3 Cirrus standalone product
A1-05 · Aurora NeuroControl	MIL-STD AI/ML	Defense-hardened plasma control · transferred from tokamak fusion · adaptive mission profile optimization
A1-06 · Power Conditioning	Mission-specific	Mode A: pulsed power (PPAC topology) · Mode B/C: continuous DC bus to A3 array

Pricing & Defense Procurement Economics

Mode A · PPAC (2026-2028)	\$70-95M (\$80M mid)	Single-use strike platform · DARPA/AFRL near-term · 50-60% Aurora gross margin
Mode A · MCIB v9 (post-2028)	\$20-30M (\$25M mid)	70% cost reduction via MCIB v9 retrofit · volume deployment unit price · margin preserved through manufacturing automation
Mode B · ISR/EW UAV	\$55-75M (\$65M mid)	Includes 1× A3 plasma toroid component (\$16M intra-portfolio transfer)
Mode C · Multi-mission Aircraft	\$300-380M (\$340M mid)	Includes 9× A3 plasma toroid array (\$144M intra-portfolio transfer)
Aurora gross margin (defense)	50-60%	Standard defense procurement margins · includes program management, integration, sustainment

10-YEAR CUMULATIVE A1 REVENUE BY PORTFOLIO SCENARIO

SCENARIO	PROBABILITY	10-YR A1 REVENUE	CONFIGURATION MIX
S1 Climate	30%	\$650M	5 Mode B + 1 Mode C · steady DoD baseline
S2 Defense	12%	\$2,800M	15 Mode B + 4 Mode C · MCIB v9 unlocks DoD program-of-record
S3 Distributed Boom	28%	\$525M	3 Mode B + 1 Mode C · commercial focus reduces defense priority
S4 Conservative	25%	\$340M	2 Mode B · slow MCIB v9 adoption · only high-confidence buyers
S5 Pivot	5%	\$180M	MCIB v9 fails · A1 reverts to PPAC-only · niche programs
Probability-weighted expected	—	\$890M	Largest single-architecture contributor to portfolio revenue (~18%)

S2 Defense scenario asymmetric upside: A1 has the highest scenario-spread of any architecture in the portfolio. S2 Defense (\$2.8B over 10 years) is 5× larger than the probability-weighted expected value, driven by DoD program-of-record commitments + MCIB v9 volume production + 15 Mode B + 4 Mode C deployments. **This is the single most important commercial outcome for Aurora's portfolio** and is gated entirely on MCIB v9 validation in 2028.

Why Aurora · Competitive Positioning

vs heritage MHD propulsion	Higher σ + helical geometry	A1's $\sigma \approx 200$ S/m at $n_e = 2.5 \times 10^{19} \text{ m}^{-3}$ exceeds heritage by 4-5× · Corkscrew topology enables mission profiles unreachable with linear channels
vs conventional propulsion (chemical)	Density / range envelope	A1 enables thrust + power densities at mission-profile altitudes/speeds outside chemical propulsion envelope
vs solid-state directed energy	Mass / thermal envelope	A1 provides plasma-class energy densities without the thermal management challenges of high-power directed energy systems
Defense procurement timeline	DARPA/AFRL early-adoption	Mode A PPAC qualified for 2026-2028 DARPA programs · MCIB v9 validation gates DoD program-of-record by 2029-2030

AURORA'S IP & HERITAGE SIDESTEP ADVANTAGES

- ✓ **Corkscrew channel geometry** — proprietary helical topology · patents pending DI-A1-002 through DI-A1-007
- ✓ **HydroSynth DBD plasma σ source** — DBD electrode design at 30 kV / 50 kHz · patents pending DI-A1-001
- ✓ **Cross-architecture A3 integration** — Mode B/C use A3 plasma toroid as power module · 100% platform technology share
- ✓ **Aurora NeuroControl (defense-hardened)** — MIL-STD-461/810 plasma control · transferred from tokamak fusion · 32-month head start
- ✓ **MCIB v9 manufacturing retrofit** — Aurora-internal vertical integration delivers 70% unit cost reduction at volume · Stage 4 Aurora capability

PATH TO COMMERCIAL OPERATION

- **Stage 1 (2026)** — Pre-hardware DBD electrode validation · Corkscrew channel CFD/E&M modeling · DARPA/AFRL Phase 1 program engagement
- **Stage 2 (2027-2028)** — Mode A PPAC FOAK build · DARPA/AFRL Phase 2 demonstration · MCIB v9 retrofit qualification
- **Stage 3 (2029-2031)** — DoD program-of-record entry · Mode B FOAK · MCIB v9 volume production launch · A3 plasma toroid integration validated
- **Stage 4 (2032+)** — Mode C aircraft-class platform · 9× A3 array integration · allied defense FMS · sustained DoD volume

Discovery Items Register: A1 has active discovery items (DI-A1-001 through DI-A1-007) covering DBD electrode lifetime at sustained operation, Corkscrew channel materials qualification, HTS magnet integration tolerances, and A3 plasma toroid component qualification. All items have explicit Stage 1/2 retire criteria and are tracked in Aurora's portfolio risk register.

NEXT STEP · DEFENSE / CLEARED

Contact CDW Research at Drumheller, AB to schedule a cleared technical briefing or initiate a DARPA/AFRL Phase 1 engagement. A1 detailed performance data is ITAR-controlled and available only under appropriate NDA + clearance. Aurora is currently engaged with DoD acquisition

