ChatGPT

High-Priority Memo: Portal Space Systems (Solar-Thermal Space Tug)

To: Advanced Tug Bus (ATB) Program Management
From: MCP Analysis Team
Date: October 24, 2025
Subject: Portal Space Systems & implications for ATB NEP tug schedule

Overview

Portal Space Systems (Portal) is a Seattle-area startup building **Supernova**, a 500 kg multi-role spacecraft that uses **solar-thermal propulsion**. Instead of electric thrusters, Portal's system concentrates sunlight onto a heat exchanger (HEX) thruster to heat a monopropellant and produce **≈6 km/s delta-v** [1]. The company positions its design as providing "nuclear-grade performance" without nuclear reactors [2].

Portal emerged from stealth in April 2024 with ~$3 million in DoD contracts and seed funding [3]. Its leadership includes former SpaceX propulsion VP **Jeff Thornburg**, who notes that **nuclear thermal propulsion is the long-term future** but isn't yet commercially viable [4]. Portal's solar-thermal design is intended as a near-term step toward that future.

Key Points from Public Sources

- **Demonstration schedule:** Portal has signed a contract with Momentus Inc. to fly its flight-computer and avionics payload on the **Momentus Vigoride 7** orbital service vehicle. The mission is scheduled **no earlier than February 2026** on a SpaceX Transporter launch [5]. Payload Space's April 2024 report notes that Portal is targeting **late 2025 / early 2026** for its first flight demo [6], and DoD customers require the capability by **2026** [7].
- **Propulsion technology:** Portal's **solar-thermal propulsion** uses deployable mirrors to focus sunlight on a thermal battery and HEX thruster, heating a monopropellant to produce high-thrust pulses [1]. This yields rapid maneuverability across LEO, GEO, MEO and cislunar space with short turnaround for payload swaps [8].
- **Performance claims:** The system delivers **~6 km/s delta-v**, an order of magnitude greater than many electric-propulsion spacecraft (typically <0.5 km/s) [9]. Portal asserts the thruster performance rivals nuclear systems but avoids regulatory hurdles [2].
- **Long-term vision:** CEO Jeff Thornburg believes **nuclear thermal propulsion** will be the future of space transportation but acknowledges it isn't yet accessible; Portal chose solar-thermal propulsion as a nearer-term analogue [4]. This suggests Portal could pivot to nuclear electric or nuclear thermal systems when they become viable.

Implications for ATB NEP Program

1. **Timeline pressure:** Portal's planned **Q1–Q2 2026** demonstration mission means a commercially funded competitor will showcase high-thrust orbital maneuvering within ~8 months of today. Their **first-to-market advantage** could influence perceptions of in-space mobility and attract DoD and commercial customers. Our NEP tug schedule must account for this external milestone.
2. **Technology comparison:**
3. **Portal's solar-thermal**: intermittent thrust (requires sunlight), high delta-v pulses, no radioactive material. Simpler regulatory path but dependent on solar availability and thermal battery storage. [1]
4. **ATB NEP (nuclear electric power)**: continuous electric thrust using nuclear reactor; higher specific impulse; longer mission endurance; but requires reactor licensing and shielding. NEP provides sustained power for both propulsion and payloads.
5. **Market differentiation:** Portal markets Supernova for **national security, science, and commercial servicing**, similar to our NEP tug's targeted applications (constellation maintenance, debris mitigation, tactical mobility). We must articulate how NEP provides unique benefits (continuous thrust, higher payload power) despite regulatory hurdles.
6. **Regulatory and public-perception risks:** Portal's solar-thermal approach sidesteps nuclear concerns and may be seen as safer. ATB's NEP tug will require demonstrating safety, handling licensing, and engaging stakeholders to mitigate negative perceptions.
7. **Strategic response:**
8. **Accelerate NEP roadmap:** evaluate whether demonstration hardware can be advanced or an interim electric/hybrid demonstration can be fielded sooner than Portal's mission.
9. **Highlight NEP advantages:** produce outreach materials emphasising continuous thrust, higher energy availability, and refueling capability; engage with DoD customers to secure requirements beyond 2026.
10. **Monitor Portal's mission:** track the February 2026 Vigoride flight; obtain performance data and customer feedback to benchmark against NEP.

Recommendations

- **High priority action:** review ATB program schedule and identify opportunities to **pull forward demonstration milestones**. Consider a phased approach where an electric-only testbed (e.g., solar-electric or chemical hybrid) validates guidance, navigation and control while NEP reactor development continues.
- **Messaging:** prepare briefings for DoD and commercial stakeholders emphasising NEP's superior endurance and continuous power. Acknowledge Portal's progress but differentiate based on mission duration, payload power, and long-term scalability.
- **Risk mitigation:** coordinate with safety and licensing teams to streamline NEP regulatory approvals; engage public affairs to communicate safety and environmental stewardship of nuclear electric propulsion.
- **Competitive intelligence:** assign a team to monitor Portal's updates and gather technical data after their demonstration mission. Use this intelligence to refine ATB requirements and ensure NEP remains competitive.

Conclusion

Portal Space Systems' rapid progress toward a **solar-thermal demonstration flight in early 2026** [5] poses a significant schedule challenge for the ATB NEP program. While Portal's technology delivers high thrust and avoids nuclear regulations, its CEO acknowledges that **nuclear propulsion is the long-term solution** [4]. To maintain a first-mover advantage, the ATB program must accelerate its development timeline, clearly communicate NEP advantages, and monitor competitor milestones.

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[1] [2] [8] Portal Systems
https://www.portalsystems.space/

[3] [6] [7] Introducing Portal Space Systems
https://payloadspace.com/introducing-portal-space-systems/

[4] [9] Portal Space Systems reveals its solar thermal propulsion plan
https://www.geekwire.com/2024/portal-space-systems-solar-thermal-satellites/

[5] Momentus to Host Portal Space Systems' First In-space Tech Demo
https://www.spacedaily.com/reports/Momentus_to_Host_Portal_Space_Systems_First_In_space_Tech_Demo_999.html