

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE**

Experimental Propulsion Lab, LLC,

Plaintiff,

v.

BAE Systems, Inc.,

Defendant.

Case No.

JURY TRIAL DEMANDED

COMPLAINT FOR PATENT INFRINGEMENT

Introduction

1. Plaintiff Experimental Propulsion Lab, LLC (“EPL”) is majority owned and controlled by inventor Matt Dushku, a mechanical engineer with expertise in aerospace and circuit card designs for missile systems. EPL owns U.S. Patent No. 9,086,033 (titled “Additive Manufactured Propulsion System”), which has a priority date of September 13, 2010. Defendant BAE Systems, Inc. has infringed and continues to infringe the ’033 patent by making, using, offering for sale, and selling the precision-guided Hypervelocity Projectile.

Plaintiff and the Asserted Patent

2. EPL is a Utah limited liability company. It was formed in 2010 to develop and manufacture innovative propulsion systems for small satellites and other spacecraft, and for other civil and military applications. As explained in a 2012 conference paper:

Safe, high-performance primary propulsion and orbital maneuvering systems will enable CubeSats (and other small satellites) to realize their full potential in a variety of civil and military applications. The Experimental Propulsion Lab (EPL) has been developing a high performance additively manufactured propulsion system that would enable these small satellites to take full advantage of low-cost responsive launches, since the satellites would have adequate propulsion to quickly move to desired orbits, even if they were launched into less-than-optimal orbits.

Dushku, M., 2012. “Additively Manufactured Propulsion System,” Proceedings of the AIAA/USU Conference on Small Satellites, Paper No. SSC12-III-2, p. 1.

3. EPL’s work led to the successful development and testing of a proof-of-concept additively manufactured hybrid propulsion system, *id.* at 2,¹ and to the filing of the application that resulted in the award of the ’033 patent. As the patent explains, EPL set out to address “problems and needs in the art that have not yet been fully resolved by currently available propulsion systems.” ’033 patent col. 1:45-47. Those problems included difficulties in

¹ As, the underlying provisional application states: “The preferred embodiment of an additive manufactured hybrid rocket motor 300 was successfully test fired on the ninth day of August 2010.” App. No. 61/403,180 at 3.

designing and manufacturing propelled objects (or their propulsion systems) that can be both structurally strong and lightweight, cost effective and uncomplicated in their assembly, and still meet the necessary parameters for flight performance and control. *Id.* col. 7:3-64. EPL addressed these problems by “incorporating a propulsion system...and a chassis structure into an additively manufactured part,” such as a “single-piece chassis and propulsion system,” that can use “a material useful as solid fuel” as part of the casing body. *Id.* col. 7:49-9:10. Among other benefits, this “permits previously unusable volume” to be used for “internal passageways” and also allows the system’s fuel to serve as part of the device structure, *id.*, having useful applications for “various types of propulsion system[s]...(e.g. rocket, missile, satellite, UAV, etc.).” *Id.* col. 6:26-27.

4. EPL’s work attracted significant interest from participants at the Small Satellites conference and others in the industry. This included Raytheon and BAE Systems. Raytheon learned of EPL’s work and patented inventions when Raytheon was developing its CubeSat and hypersonic projectile programs. Raytheon even went on to copy EPL’s work in its own later-filed patents,² while BAE Systems went on to manufacture and sell infringing products.

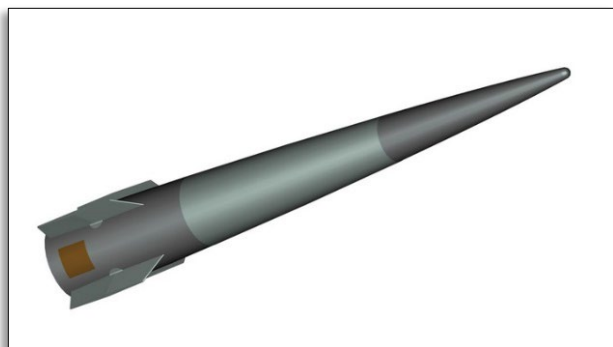
Defendant and the Accused Product

5. BAE Systems is the U.S. subsidiary of BAE Systems plc, a British defense and aerospace company. BAE Systems’ Platforms & Services sector manufactures artillery and munitions, including precision guided munitions such as the Hypervelocity Projectile, which is sometimes referred to by or with other trade names (such as XM1155-SC, Scorpio-XR, Extended

² See U.S. Patent No. 10,247,530 (“Projectile with Single-Piece Main Body”), issued to Raytheon on April 2, 2019, with a filing date of July 22, 2016; U.S. Patent No. 10,662,898 (“Integrated Thruster”), issued to Raytheon on May 26, 2020, with a filing date of September 8, 2016; and U.S. Patent No. 10,823,115 (“Hybrid Rocket Motor with Integral Oxidizer Tank”), issued to Raytheon on November 3, 2020, with a filing date of February 16, 2016.

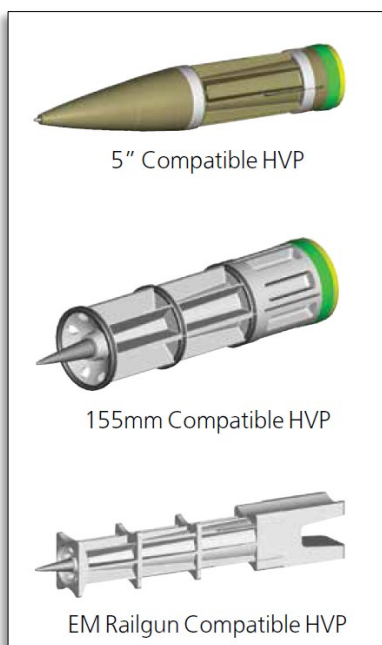
Range Hypervelocity Projectile, or Gun-Launched Guided Projectile) (collectively the “Hypervelocity Projectile” or “HVP device”).

6. “The Hypervelocity Projectile (HVP) is a next-generation, common, low drag, guided projectile capable of executing multiple missions for a number of gun systems.”³



The projectile is compact and lightweight, measuring 24 inches in length and weighing 28 pounds, which enables a reduction in production costs and “low-cost mission effectiveness.”⁴ The projectile’s small size

also facilitates its compatibility with various types of guns and artillery.⁵



³ <https://www.baesystems.com/en-us/product/hyper-velocity-projectile-hvp>.

⁴ *Id.* (“Hypervelocity Projectile (HVP) datasheet” download) at 2; <https://www.baesystems.com/en/multimedia/hypervelocity-projectile-base-model>.

⁵ *Id.* (diagram of HVP in different sabots); Hypervelocity Projectile (HVP) at Sea Air Space 2024 (<https://www.youtube.com/watch?v=sbf0UHH800s>) (photos of HVP in different sabots).

7. The Hypervelocity Projectile's precision, performance, and relatively low cost result from its infringing design, which is addressed further below.

Jurisdiction and Venue

8. This is an action for patent infringement arising under the patent laws of the United States, 35 U.S.C. §§ 271 and 281, *et seq.* This Court has original jurisdiction over this patent infringement action under 28 U.S.C. §§ 1331 and 1338(a).

9. Because BAE Systems was incorporated in Delaware, this Court has personal jurisdiction and venue is proper in this District under 28 U.S.C. §§ 1391 and 1400(b).

Count 1: Infringement of the '033 patent

10. EPL incorporates by reference each of the foregoing paragraphs of this Complaint as if fully set forth herein.

11. On July 21, 2015, the U.S. Patent and Trademark Office issued U.S. Patent No. 9,086,033, attached as Exhibit A. The patent's term extends to May 21, 2034. EPL owns all right and title to the '033 patent, including the right to enforce the patent against infringers and collect damages for past and ongoing infringement.

12. Each claim of the '033 patent is valid, enforceable, and patent eligible under Section 101 of the Patent Act. The claims are directed to the technical field of designing and manufacturing improved propulsion systems for use in the aerospace and other industries. The '033 patent discloses and claims systems and devices that address problems with prior systems—including limitations on volume efficiency, performance and control, structural stability, and production complexity and cost—with technical solutions. The patent's solutions include novel and nonobvious systems for the design and manufacture of small and compact propulsion systems that use fuel as part of the device structure and meet the performance and control parameters needed for the particular mission or application.

13. BAE Systems has infringed and continues to infringe several claims of the '033 patent, including, for example, claim 1. Each element of claim 1 is met by the Hypervelocity Projectile, according to the following infringement theory, which is provided as an example and is not limiting.

- **[preamble] “A propulsion system, comprising”:**

A propulsion system may consist of a system for “propel[ling] objects, such as rockets and missiles.” '033 col. 1:19-20. The propulsion system may form part of the same structure that contains or constitutes the object being propelled. '033 col. 2:17-21 (“A chassis may extend from the casing body. The chassis and casing body may be a single piece structure having no bonded or bolted joints. The chassis may be a satellite chassis, a missile chassis, unmanned air vehicle (UAV) chassis, or a rocket chassis.”).

The Hypervelocity Projectile contains a propulsion system. The device is a “guided” projectile—i.e., it can be guided, or steered, during its flight.

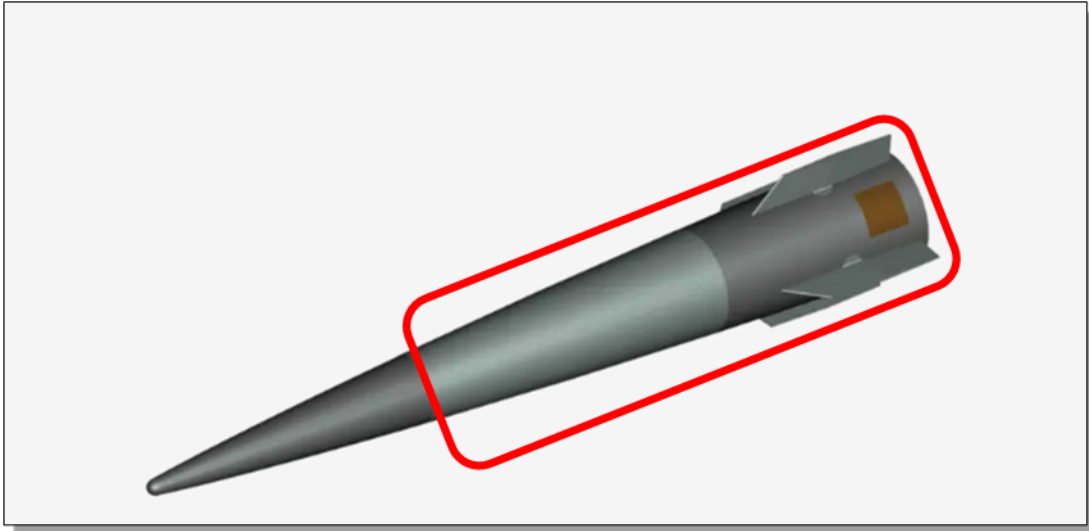
- “The Hypervelocity Projectile (HVP) is a next-generation, common, low drag, guided projectile capable of executing multiple missions for a number of gun systems.”⁶
- “Scorpio-XR is the latest precision guided munition in the Hypervelocity Projectile (HVP) family of munitions.”⁷

For the device to reach very high speeds (or “hypervelocity”) and be precision guided, it requires more control authority than the device’s fins can achieve. Further, the device does not contain a motor that can be used for any purpose, including guiding. *Id.* (“The high-velocity compact design relieves the need for a rocket motor to extend gun range.”). Rather, the Hypervelocity Projectile requires and does contain an attitude control propulsion system within the device that is able to provide the necessary yaw and pitch controls or x/y translations that are

⁶ <https://www.baesystems.com/en/product/hyper-velocity-projectile-hvp>.

⁷ <https://www.baesystems.com/en/product/xm1155-sc>.

needed for precision guiding. The propulsion system is located within the portion of the device encircled in red below:



- **[a] “a casing body consisting of a material useful as a solid rocket fuel and capable of being consumed during combustion;”**

The propulsion system within the Hypervelocity Projectile includes a combustion chamber and a fuel chamber, as discussed below, both of which are enclosed within a structure that constitutes a casing body. The casing body consists of solid rocket fuel that is capable of being consumed when combusted. The casing is made of rocket fuel to aid the compactness and volume efficiency of the device. The casing is not made of liquid rocket fuel because the high precision small valves and hydraulics that would be required would not provide a feasible design choice for the Hypervelocity Projectile’s application. Rather, solid rocket fuel is used as the casing for the propulsion system because it provides structural support and can sustain the shock load of a gun or cannon launch and the g forces of flight.

- **[b] “a combustion chamber defined within the casing body”**

A combustion chamber may consist of a hollow region or cavity where fuel and oxidizer are ignited or combusted. A combustion chamber is required in a propulsion system that

provides precision guiding, as in the Hypervelocity Projectile. In the device, the combustion chamber is contained within the casing body for volume efficiency.

- [c] **“a fuel chamber defined within the casing body and circumscribing at least a portion of the combustion chamber, the fuel chamber storing an oxidizer prior to the oxidizer being injected into the combustion chamber, wherein the casing body includes an oxidizer outlet port which outlets oxidizer from the casing body prior to being injected into the combustion chamber.”**

The Hypervelocity Projectile’s propulsion system is inoperable without an oxidizer that combines with the fuel to combust. Within the casing body, the Hypervelocity Projectile also includes a fuel chamber that stores an oxidizer in the form of a liquid or a pressured gas (such as Nitrous Oxide). The fuel chamber is designed to at least partially surround the combustion chamber to achieve compactness and to help the device sustain the high pressure exerted on the device during launch and flight. The oxidizer is injected into the combustion chamber to allow combustion to occur through, or using, tubing or channels that include or serve as outlet ports.

14. BAE Systems’ infringement has been willful. BAE Systems has known of the ’033 since at least August 28, 2023, when it received a letter from EPL identifying the patent and the Hypervelocity Projectile. In response, BAE Systems provided no basis for non-infringement and purposely shielded itself from substantive discussions concerning its infringement. BAE Systems also knew or was willfully blind to the existence of the ’033 patent prior to that date, including when it first began work on the Hypervelocity Projectile, as a result of EPL’s published work and patent filings and likely through the work and later-filed patents of Raytheon that copied EPL. Despite this knowledge and awareness, BAE Systems has engaged in and continues to engage in infringing activities in continuing to manufacture and sell the Hypervelocity Projectile without a license.

15. EPL has been damaged by BAE Systems’ infringement of the ’033 patent and is entitled to damages under 35 U.S.C. § 284, including enhanced damages.

PRAYER FOR RELIEF

EPL prays for the following relief:

- A. A judgment that BAE Systems has infringed the '033 patent and done so willfully, and that the asserted claims of the '033 patent are valid, patent-eligible, and enforceable;
- B. A judgment awarding compensatory damages under 35 U.S.C. § 284 for BAE Systems' infringement and enhanced damages due to the infringement being willful;
- C. Pre- and post-judgment interest;
- D. Costs of suit and, to the extent applicable under law, attorneys' fees; and
- E. Any additional legal or equitable relief that the Court deems just and proper.

DEMAND FOR JURY TRIAL

EPL demands trial by jury on all claims and issues triable by a jury.

Dated: November 22, 2024

Respectfully submitted,

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