

Steam Catapults for US Supercarriers: the Clash Between Magnetic Innovation and the Retro Choice

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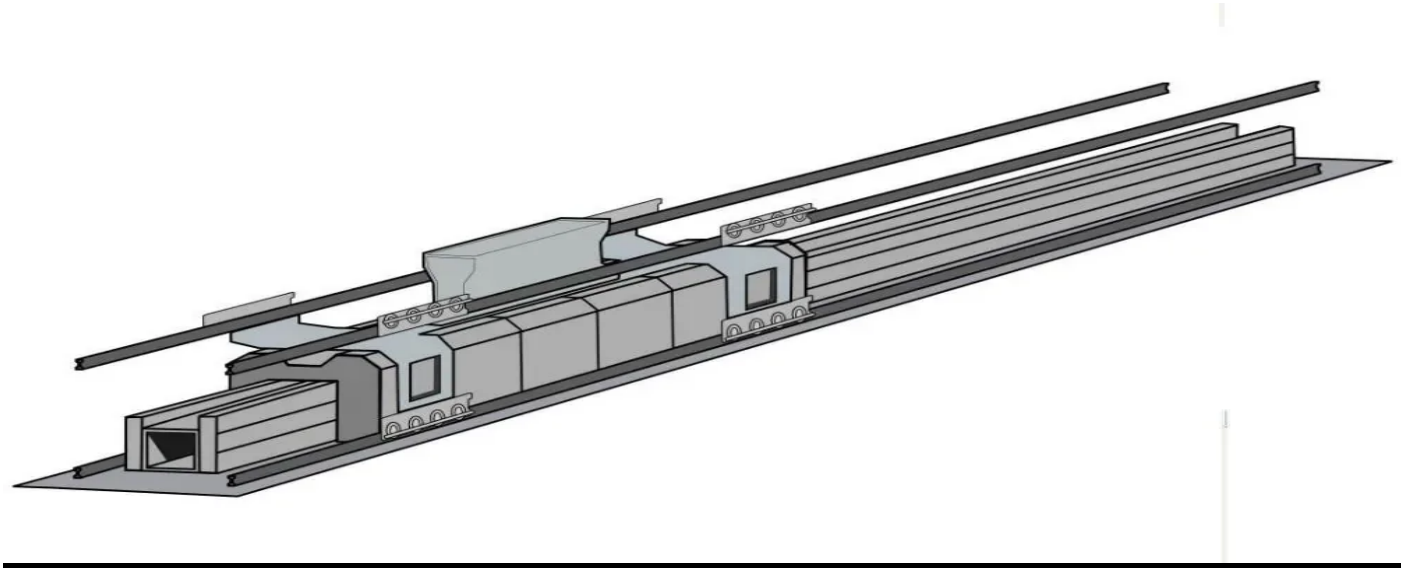
The future of the United States Navy's supercarriers takes an unexpected and controversial turn. With a national security memorandum, the Trump administration has ordered the abandonment of advanced electromagnetic catapults on units following the *Gerald R. Ford* class, imposing a return to the tested but outdated **steam system**. A decision that reopens a bitter debate among military leaders, defense giants, and the strategic vision of the White House, questioning the technological standard that guides the new generation of global aircraft carriers.

The Technological Comparison: EMALS vs. Traditional Steam

Introduced in the 1950s, steam catapults have ensured decades of exceptional reliability. However, the technology presented evident structural limitations: operating without a true feedback control system, the old pistons generated sudden force spikes (*transients in tow force*) capable of prematurely wearing and damaging aircraft airframes. Moreover, the energy inefficiency of steam and the rigidity of the system prevented the safe launch of very light aircraft, such as modern drones (UAVs).

To overcome these obstacles, *General Atomics* developed the **EMALS (Electromagnetic Aircraft Launch System)**, installed for the first time on the lead ship *USS Gerald R. Ford*:

- **Operating Principle:** Instead of using steam, EMALS employs a **linear induction motor (LIM)** approximately 91 meters long. Controlled electric currents generate magnetic fields that accelerate a carriage along the track, pushing aircraft up to 45,000 kilograms to speeds close to 240 kilometers per hour in seconds.
- **Energy Storage and Release:** The system draws energy from the ship during a 45-second recharge cycle, storing it kinetically through four disk rotors, then releasing peaks up to 484 megajoules at launch.
- **Operational Advantages:** Thanks to Hall effect sensors and a closed-loop system, EMALS ensures constant towing force, drastically reducing mechanical stress on aircraft. It is lighter, requires less maintenance, eliminates the need for large amounts of freshwater for desalination, and can easily handle both very heavy aircraft and light drones.



The Return to Steam for US Supercarriers: the Clash Between EMALS Innovation and the Retro Choice

A Billion-Dollar and Contested Decision

Despite nearly 37,000 flawless launches with EMALS on the *USS Gerald R. Ford* alone, political pressure has imposed a radical shift starting with the fourth unit of the class, the future *USS Doris Miller*. The first three ships (*Ford*, *John F. Kennedy*, and *Enterprise*) will retain the electromagnetic system, but subsequent ones will have to revert to steam.

The choice has sparked immediate concerns for three main reasons:

1. **Engineering Complexity:** The *Ford* class ships were entirely designed around the electrical architecture. Reintroducing steam requires dismantling and redesigning crucial sections of the ship.
2. **Industry Costs and Delays:** *General Atomics* has warned that work on the *Doris Miller* is already over 50% complete. Modifying the project mid-course will entail enormous risks on timing, integration, and a billion-dollar bill for American taxpayers.
3. **Strategic Gap:** While the United States slows down to revive a technology from the last century, **China** is already successfully employing electromagnetic catapults on its latest carriers, and France has chosen electromagnetism for its future flagship.

The presidential crusade against digital complexity thus clashes with the needs of modern naval engineering, leaving open the question of whether the return to steam represents an anchor to security or an expensive technological misstep.

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