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China's Aircraft Carrier *Fujian*: Milestone Achieved, Challenges Ahead in Carrier Aviation

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1. The Emergence of *Fujian* and Its New Carrier Aircraft

On September 22, 2025, Chinese media broadcasted that three People's Liberation Army Navy Air Force (PLANAF) carrier aircraft—the J-35 stealth fighter, the J-15T fighter, and the KJ-600 airborne early warning and control (AEW&C) aircraft—successfully conducted catapult launches and arrested landings on China's third aircraft carrier, *Fujian*[1]. These three new types of carrier-based aircraft assigned to the PLANAF also flew over Tiananmen Square during China's military parade on September 3 last month, drawing significant attention[2].

The aircraft carrier *Fujian* is the third ship in the series, following the lead ship *Liaoning* and the second ship *Shandong*. It is the first domestically built aircraft carrier in China to adopt a "flat-top" design with a full-length flight deck, boasting a size nearly equivalent to the U.S. Navy's Nimitz-class nuclear-powered aircraft carriers. Notably, it enables the launch of carrier-based aircraft using the Electromagnetic Aircraft Launch System (EMALS) rather than the previous ski-jump method.

Chinese media have been extensively reporting that the aircraft carrier *Fujian* is approaching a level of operational readiness close to actual combat capability[3], and foreign media also reported that this success signifies more than just a technical breakthrough[4], as it will expand the combat range beyond that of the aircraft carriers *Liaoning* and *Shandong*, granting the PLA Navy blue-water capabilities[5].

On the other hand, it is worth noting the Chinese authorities emphasized that "this represents a new leap forward in our country's aircraft carrier development, demonstrates the electromagnetic catapult launch and arresting landing capabilities of the aircraft carrier *Fujian*, and marks a significant milestone in advancing the transformation of PLA navy[6]." It's easy to imagine China wanting to show off its technological advancement, but it likely wanted to highlight that the *Fujian* aircraft carrier is equipped with an EMALS launch system and arresting gear.

It cannot be definitively determined whether this successful report constitutes the "world's first case of launching a stealth aircraft using EMALS." The U.S. Navy has already fielded EMALS on the Gerald R. Ford and may well have conducted non-public trials with the F-35C. Therefore, whether it is the "world's first" requires careful verification[7]. Even so, for the PLA Navy itself, these successful catapult launches and arrested landings indisputably mark a major step forward in carrier aviation.

In the meantime, these EMALS launch systems and arresting gear represent new technologies that have posed challenges for the U.S. Navy in recent years, and the PLA Navy will also face similar operational challenges in preparing for combat deployment. This paper discusses the significance of carrier-based aircraft operations aboard the aircraft carrier *Fujian* from this perspective. It also examines the underlying technical and human resource challenges.

2. Three New Carrier-Based Aircraft and Their Significance

The three types reported to have launched via EMALS are:

(1) J-35 Stealth Fighter

The J-35 is a new-generation carrier-based fighter independently developed by China, featuring stealth capabilities. According to CCTV, military analyst Zhang Junsh（张军社） stated: "The J-35 is a domestically developed, new-generation carrier-borne fighter. It is a breakthrough platform for the Navy's shift from near-seas defense to far-seas defense[8].

Indeed, the J-35's entry into service signifies that China has become the second country in the world after the United States to develop and possess a stealth carrier-based fighter. If it has superior stealth capabilities, it may be able to penetrate enemy air defense networks more easily.

(2) Improved J-15T Fighter

The J-15 made its debut as a carrier-based aircraft when the first aircraft carrier, the *Liaoning*, entered service in 2012, but it has been repeatedly involved in accidents, raising concerns about its safety and reliability. In 2016, multiple crashes occurred within a short period, leading to criticism of the flight control system and quality assurance deficiencies[9].

This J-15T is the "T" variant developed through addressing such problems. Its key feature lies not only in upgrading its electronics to the latest systems, but also in reinforcing the J-15's nose landing gear (NLG) section to enable launch via the EMALS system[10]. This marks a step forward from the past history of repeated crashes, bringing them closer to actual combat operations. Unlike previous ski-jump methods, EMALS launch enables an increase in the maximum takeoff weight of carrier-based aircraft. Consequently, the J-15 can carry increased weaponry and extended range. Combined with the J-35's stealth penetration capabilities, this could yield a "high–low mix" that enhances the carrier group's blue-water combat potential.

(3) KJ-600 AEW&C

The KJ-600 is China's first domestically developed fixed-wing carrier-based early warning aircraft, but it is very similar to the U.S. Navy's E-2D Hawkeye. Until this point, early warning missions have been conducted by carrier-based helicopters, but the introduction of the KJ-600 will likely enable high-

altitude, long-range surveillance and monitoring. The aircraft carrier *Fujian's* EMALS catapult system made it the first carrier capable of launching aircraft in this manner, and it is being widely publicized as the entity that provides the carrier strike group with its "flying eyes" and "brain."[11]

There is no doubt that the KJ-600's capability to operate from aircraft carriers has significantly improved China's maritime combat environment. Indeed, while the KJ-600's capabilities still fall short of the U.S. Navy's E-2D in terms of operational reach, the very fact that the PLA Navy has reached the stage of operating fixed-wing early warning aircraft signifies that its aircraft carrier operations have entered a new dimension.

3. Building the Carrier Aviation: The Road to *Fujian*

The successful carrier landings and takeoffs achieved by these three new aircraft models represent the culmination of years of accumulated effort in the history of China's carrier aviation. The first aircraft carrier landing in Chinese history was achieved in November 2012, during a test involving a J-15 fighter jet on the first aircraft carrier, the *Liaoning*[12]. The success at the time was widely broadcast domestically and treated as a national event celebrated by the PLA Navy and the entire aircraft industry[13].

The following year, 2013, saw the formal establishment of the "Carrier Aviation Unit" within the PLANAF. This unit was comprised of fighter squadrons, maintenance support units, and multi-purpose helicopter units, and it began operations centered mainly on J-15s. As Zhang Shaobing（張少兵）, the unit's first commander at the time, confessed, training carrier-based aircraft pilots had been extremely difficult[14].

Therefore, they had to rigorously select pilot candidates from the very best tier, regardless of whether they were for the PLANAF or the PLA Air Force (PLAAF). Then, China gathered veteran pilots with experience flying over five types of aircraft and a total flight time exceeding 1,000 hours as its first candidates for carrier-based aircraft pilots. Using them as the core, it began building its unit[15]. The Carrier Aviation Unit faced immense challenges from its inception—no instructors, no training materials, no prior experience—yet persisted in conducting repeated test flights of the J-15 carrier-based fighter[16]. By 2021, it had achieved the capability to perform aerial refueling between J-15 aircraft[17].

Additionally, as of 2017, equipment resembling EMALS was observed at the Huludao airfield in *Liaoning* Province[18]. Furthermore, given that the head of electromagnetic catapult development achieved an unusual promotion to member of the CCP Central Committee, it was speculated that EMALS would likely be installed on the third aircraft carrier[19]. On the extension of this accumulation, the recent successful the Catapult Launch and Arrested Landing on the aircraft carrier *Fujian* is regarded as a milestone.

Indeed, as emphasized by the PLA Daily on September 23, 2025, China has achieved domestic aircraft carrier production in just over a decade—starting from zero experience and expanding its fleet from one to three carriers—while rapidly advancing the operational infrastructure for carrier-based aircraft from ski-jump takeoff to catapult launch[20].

Nevertheless, the successful launch from the EMALS system on the aircraft carrier *Fujian* itself does not instantly guarantee operational capability, and many technological and personnel challenges remain.

4. Technological and Human Resource Challenges: The Outlook

(1) Challenges Experienced by the U.S. Navy with EMALS and Arresting Gear

The use of the EMALS catapult system, which does not have the complex structure of conventional steam catapults, is expected to significantly reduce the time required for preparing the next launch immediately after launch, thereby increasing the sortie rate of carrier aviation. Meanwhile, even the U.S. Navy, which began EMALS trial operations ahead of schedule in 2017, has spent years working on the configuration and adjustment of both EMALS and the arresting gear system[21].

For example, it is said that the EMALS settings must be adjusted for the F/A-18E/F Super Hornet carrier-based aircraft of the U.S. Navy's Gerald R. Ford-class aircraft carrier, which is purely equipped with air-to-air weapons, compared to an F/A-18E/F carrying ten 1,000-pound-class precision-guided bombs. In other words, since the maximum takeoff weight differs significantly between relatively lightweight fighters armed only with air-to-air missiles and fighters loaded with as many bombs as possible, it is necessary to adjust the settings for launching aircraft via EMALS according to the specific conditions of each individual aircraft launched[22]. Furthermore, not only weapon systems but also additional fuel tanks could interfere with the EMALS system. The U.S. Navy had to closely verify that EMALS would operate normally under various combinations involving aircraft type, weapon systems, additional fuel tanks, and aircraft gross weight.

Similarly, they may have to conduct repeated verification during landing. It is necessary to adjust the settings of the arresting gear while taking into account each aircraft's weapons load and remaining fuel, and the U.S. Navy has struggled to collect and compile the vast amount of verification data required for this[23]. Joseph Trevithick, who has focused on these U.S. Navy issues and the resolution process, points out that the Navy continues to improve the system's reliability, aiming for a rate of one major failure per 16,500 EMALS launches[24].

(2) China's technical challenges (EMALS and arresting gear) and human resource challenges (pilot training)

The aircraft carrier *Fujian* is China's first carrier equipped with EMALS system. Compared to ski-jump carriers like the *Liaoning* and *Shandong*, it holds the potential to dramatically improve sortie efficiency and the variety of aircraft it can load. However, as experienced by the U.S. Navy aircraft carrier USS Gerald R. Ford, it would require close adjustments based on the weapons and fuel load of the carrier-based aircraft, requiring the collection of sufficient validation data for this purpose.

Landing operations also require adjustments to the arresting gear system that account for remaining fuel and weapon load, which will also necessitate extensive testing and data collection. Given these factors,

it is likely that considerable time will be required before the aircraft carrier *Fujian* can be fully deployed for combat operations.

Furthermore, PLA Navy faces potential constraints not only in technical aspects but also in human resources, particularly regarding the training of carrier-based aircraft pilots. China began a major shift in its training methods around 2020, anticipating increased demand for carrier-based aircraft pilots alongside its expansion of aircraft carrier production.

They have transitioned from the "aircraft transition mode（改装模式）," which assigned veteran pilots to carrier-based aircraft, to the "growth mode," which trains young pilot candidates around age 20 in carrier takeoffs and landings from an early stage[25]. In other words, Previously, carrier-based aircraft pilots were selected based on having over 1,000 hours of flight experience on third-generation fighters (三代机 1000 小时以上的飞行经验). However, due to changes in the flight training system starting in 2020, young pilots with less than 100 hours of flight experience on third-generation fighters (三代机飞行时间不足百个小时) are now being trained as carrier-based aircraft pilots[26].

This would enable the expansion of the pilot resources, but the increase in inexperienced young pilots means that operations will likely be restricted primarily to daytime flights under visual meteorological conditions (VMC) for the near future. Furthermore, it seems essential that they continue to develop their flight skills through long-term training and practical experience to ensure they can not only launch and land on carriers but also establish the flight skills necessary to fight in actual air combats.

5. Conclusion

The successful EMALS launches and arrested landings of the J-35, J-15T, and KJ-600 aircraft on the aircraft carrier *Fujian* this time demonstrates that China has reached a new stage in its carrier aviation capabilities. These EMALS-launched carrier aircraft can effectively conduct carrier strike group operations—such as anti-submarine patrols and air defense missions—in coordination with accompanying vessels. This will significantly enhance China's overall naval capabilities. In particular, the KJ-600's capability to operate from aircraft carriers represents a significant achievement for the PLA Navy, greatly advancing improvements in its maritime combat environment.

However, this is not the "completion of operational deployment," but rather the "starting point for challenges." The PLA Navy still faces numerous hurdles to overcome, including improving the reliability of EMALS and arresting gear systems, collecting vast amounts of operational data, and expanding the quantity and enhancing the quality of its carrier-based aircraft pilots. As aircraft carriers equipped with electromagnetic catapults, like the *Fujian*, are expected to increase in number, it is important to analyze calmly and continuously how China overcomes challenges on both the hardware (establishing technical

reliability) and software (maturing pilot training systems) fronts, rather than simply taking Chinese announcements at face value.

It would be reasonable to assume that the aircraft carrier *Fujian* and these new carrier-based aircraft will only approach true operational readiness after years of experimentation.

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