The Military Aerospace Supremacy Index: A Comprehensive Score of America's and China's Multirole and Fighter Aircraft Based On Quantity, Performance, Cost, and Strategic Effectiveness

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A Dissertation Submitted to

The Department of Political Science at the

University of California, Irvine, on

June 20th, 2025

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Abstract

This thesis develops a power scoring index for military assets, aiming to objectively and comprehensively summarize a country's aerospace capabilities. This index attempts to culminate multiple criteria of a military's aerospace assets, including quantity, performance, costs, and strategic effectiveness. By using a uniquely developed formula, these criteria are numerically evaluated as a system of efficiencies, computing a numerical score that compares the relative power projection of two or more arsenals. As a case study, the multirole and fighter aircraft across the United States and China are evaluated using the index formula, scoring 198,938 points for the former and 152,758 points for the latter. The index reveals important information about each arsenal's capabilities, such as a quantity advantage for the United States and a quality edge for China. However, this study poses several limitations, including low accessibility to sensitive technological data, as well as inherent subjectivity and bias in the scoring process. While these limitations leave the index incomplete, strategies to remove and mitigate these weaknesses can be made for future reference and research.

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List of Abbreviations

Abbreviation	Definition
CCP	Chinese Communist Party
CMC	Central Military Commission
DoD	Department of Defense
FGA	Multirole Aircraft
FTR	Fighter Aircraft
MAEROS	Military Aerospace Supremacy (Index)
NAI	Net Asset Index
PLAAF	People's Liberation Army Air Force
PLA	People's Liberation Army
PRC	People's Republic of China
SAI	Specific Asset Index
USAF	United States Air Force
US	United States

Chapter I - Introduction

Since the Wright brothers' first flight in Kitty Hawk, North Carolina, in 1903, the United States has been the epicenter of aerospace pioneering. The birth of this new technology is not exclusive to transportation, but also to how nations are defended. An aircraft's unique ability to fight in combat was first witnessed as far back as 1911 during the Italo-Turkish War, and its use has only been more relevant ever since. Consequently, the 20th century saw an explosive development of new aerospace military technology, and an entire industry that continues to grow off competition. However, unlike most businesses, competition in the aerospace industry is unique because it is often fueled by governments with diverse interests, including political, economic, and military considerations. The evolution of the relatively simple Wright Flyer to the sophisticated Lockheed Martin F-35 resulted from investments motivated by competing interests at an international level. Most military aircraft and aerospace assets are designed and built to satisfy a country's competing defense policy. Today, this notion remains especially true for two nations seeking to dominate the 21st century.

Emerging Competition

The United States of America, despite being around for less than a quarter of the last millennium, has cemented itself as the largest aerospace powerhouse in human history. The end of the Cold War signaled the beginning of a period in history dominated by US interests. Although this success is due to various factors, the US's military aerospace infrastructure played an important role in enforcing the US's demands to project power. One example of such is the development of the Minuteman ICBM program, enabling the US to target a nuclear warhead across expansive Soviet territories. This was essential to bolster America's arms race against the Soviet Union, creating a barrier of deterrence from possible escalation toward nuclear war. At the end of the Cold War, each nation's nuclear capabilities became a topic of diplomatic discussion, further highlighting this aspect of aerospace integration with defense policy.

When deterrence is no longer on the table, the US's aerospace assets are also prepared and tested for military conflict. An illustration of this is portrayed by Operation Desert Storm in 1991, which first began as an aerial bombardment of Iraq following Saddam Hussein's invasion of Iraq. One objective of this bombing is to obtain aerial superiority, diminishing Iraq's ability to fight against aerial assets from the ground and air. With the US providing over 1,300 aircraft, the Iraqi air force was incapacitated within one week, minimizing losses for United Nations forces (Air & Space Forces, 2022). This further allowed for the ground invasion of Iraq and the eventual liberation of Kuwait following Hussein's orders to retreat. This event showcases not only America's tactical strength and strategic alliances, but also the capabilities and performance of individual aircraft, projecting strength and power. The US's success in the military campaign alone further cemented its reputation as a formidable power with extensive aerospace capabilities, deterring other actors who dared oppose it.

Another characteristic of America's aerospace unipolarity is demonstrated by its aviation and aerospace market, often ranked as the largest. The United States is consistently ranked as the largest aircraft manufacturer and exporter, earning $40.3 billion in 2022 (OEC, 2024). Meanwhile, the People's Republic of China (PRC) has maintained a historically hidden aerospace industry, although this is quickly shifting. Due to increasing demand, China's civil aviation market is the world's second-largest and is expected to surpass the United States by 2043, according to current trends (Airbus, 2024). This projection is the economic driving factor behind China's development of a homegrown aerospace industry. Taking steps, the Commercial Aircraft Corporation of China (COMAC) seeks to compete with the European Airbus A320 aircraft and America's Boeing B737, two common single-aisle passenger aircraft. While the C919 by COMAC is still heavily reliant on foreign imported parts, the aircraft is designed to compete in the same market as the B737 and A320, making it a viable contender for customers seeking alternative options.

Although these trends directly correspond to a domestic, civilian market, the PRC's desire to bolster homegrown civil aviation manufacturing should be treated as a matter of national security for the US. China's state-owned aircraft manufacturers, including COMAC, the Aviation Industry Corporation of China (AVIC), and Shenyang Aircraft Corporation (SAC), operate as multipurpose aircraft manufacturers, spanning commercial and defense sectors. Many of the same technologies, research, and applications are shared between commercial, private, and military aircraft, a trait also shown in American manufacturers. For example, the P-8 Poseidon patrol and reconnaissance aircraft is a derivative of the civilian Boeing B737-800 aircraft. As for China, the SAC has repeatedly worked on civilian and military aircraft, such as the ARJ21 and fifth-generation J-35 stealth fighter. Not to mention, China's state ownership of aircraft manufacturers gives the single-party state greater control over production, creating leverage that satisfies its national security and defense strategy by definition of state ownership.

Thus, the growth of the aviation market and defense spending are synonymous. This notion is important to recognize because it reveals only a small, but apparent, fraction of the race towards military aerospace supremacy in the 21st century. To illustrate, the People's Liberation Army (PLA) spending increased from $9.93 billion to $291.96 billion from 1990 to 2022 (World Bank Group, 2022). While remaining well below the US budget, the World Directory of Modern Military Aircraft estimates the People's Liberation Army Air Force (PLAAF) operated 3,733 active aircraft in 2024. Meanwhile, the US Air Force (USAF) had just over 5,000 with a budget three times larger (WDMMA, 2024). While these numbers may reveal China's higher purchasing power, they still indicate its intentions to grow its military, motivated by some defense policy or national strategic interest.

The PRC has come a long way since its founding in 1949, in addition to its internal and external struggles over an entire century prior. With that in mind, it is no wonder that recent unprecedented growth is met with an ambition to bolster its status as a world superpower, which cannot be achieved without a proper military to defend its interests. China has taken opportunities to participate more actively on the world stage, seizing opportunities for direct foreign investments, establishing trade networks, fostering diplomatic relationships, and increasing its security presence in East Asia. While doing so, China has taken its aerospace sector with it, using it to establish a military to obtain such strategic interests by occupying man-made islands in the South China Sea and leaving the option to annex Taiwan by force. These actions by the PRC continue to compete with American interests, and it has become increasingly necessary to maintain its military aerospace assets to do so.

Preview of the Military Aerospace Supremacy Index

During any competition, it is natural to wonder and often necessary to know who is "winning." For some applications, such as sports, the solution is defined by rules that dictate the game. Sometimes, competition is not needed at all; some quantifiers identify the strength of natural disasters or the effective horsepower of an automobile through different analytical methods, taking a scientific method into account. While an index or ranking can be identified through objective truths, creating one perfectly free of subjective statements for a military comparison is impossible. While the economics and sheer size of a military's assets play a significant role in determining its strengths, these quantities alone do little to highlight qualitative issues that could reveal overlooked deficiencies.

Instead, this thesis develops a unique and accurate method to rank a military's aerospace supremacy (MAEROS), which must weigh quantitative and qualitative factors to create a comprehensive picture of reality. Given publicly available information, the MAEROS index should highlight the strengths and weaknesses of a military's aerospace assets from the following four criteria.

1. Quantity (C_1): The MAEROS index should be a function of each military's quantity of aerospace assets, a whole number quantifying the number of specific assets owned by a military's arsenal.
2. Quality (C_2): The MAEROS index should be a function of each military's quality of aerospace assets. Quality should evaluate the performance of an aerospace asset relative to other assets serving the same or similar mission.. The quality of an asset should indicate a level of technical excellence that reflects a country's overall capabilities.
3. Financial Liability (C_3): The MAEROS index should be a function of an asset's costs within its arsenal to account for liabilities that diminish its capabilities and readiness, as engineering faults should be reflected in the quality index.
4. Strategic Effectiveness (C_4): The MAEROS index should consider a country's level of effectiveness in accomplishing its respective defense policy and military interests.

Additionally, the definition of military aerospace supremacy (MAEROS) is not to be confused with the aerial supremacy, or air superiority, doctrine of warfare. Like aerial supremacy, MAEROS considers the capabilities of air power through a military campaign, although it differs through quantitative and qualitative predictions. However, MAEROS encompasses a broader picture of a military's aerospace complex to determine a relative degree of power projection that can be used to compare a nation's aerospace capabilities.

While some data are objectively true and readily available through public resources, others are not clearly defined. For instance, the first criterion is just a quantity of a specific asset, such as the 76 B-52 bombers in the US military (Defense News, 2024). While the numbers can fluctuate at any moment, an estimate based on low variance can be approximated for reasonable analysis. On the other hand, some quantitative data, such as the third criterion, have yet to be determined. Does the cost include unit cost, maintenance, wages, operation hours, etc.? Is cost a matter of purchasing power? While the latter question should be considered, the overall function of cost and its practicality remains to be seen through literature reviews.

Additional quantitative factors can also be made by examining an asset's technological capabilities. Determining the second criterion is largely based on an aircraft's performance using fundamental engineering principles in aerodynamics, dynamics, and design. While the data is objectively based on these principles, weighing different aspects (such as an aircraft's thrust, range, speed, etc.) is subjective. For example, in most applications, a transport aircraft's payload score should be weighed differently from a reconnaissance aircraft. Ultimately, the method to investigate how these weights should be implemented to an aircraft's quality score remains to be determined.

Lastly, the fourth criterion remains the most subjective as it analyzes the effectiveness of a military's strategy in advancing its interests. Understanding a level of effectiveness comes with understanding what those interests are and their respective levels of success in utilizing aerospace equipment. Apart from fiscal costs, which are accounted for in the second criterion, this factor of effectiveness analyzes policy and approach. Although a quantification method has yet to be found, this ensures the index encompasses the political ramifications of the arsenal, domestically and abroad.

The complexity of different variables suggests the use of a multi-criteria decision analysis as a possible methodology. One theory that could be formulated is based on fundamental efficiency, where the net efficiency of a system, or the index score, is equal to the product of internal efficiencies, which are the acting criteria. While the relationship between C_1, C_2, and C_3 is likely a product of one another acting as a total index for a specific asset (*j*), the ultimate index is a summation of all (*n*) assets that could be scaled to C_4, or the strategic effectiveness criterion. One hypothetical equation is shown below.

$$\text{MAEROS Index of Country "A"} = C_4 \sum_{j=1}^{n} \left[C_1\, C_2\, (1 - C_3)\right]_j$$

The equation above shows that increasing the MAEROS index can be achieved by increasing the quantity criterion (C_1), the performance criterion (C_2), and the effectiveness criterion (C_4) while minimizing the cost index (C_3). While C_4, which accounts for all aerospace assets, is an opinion based on research, evidence, and analytical reasoning, it remains uncertain if this criterion can be numerically defined. As previously mentioned, the political ambiguity of this variable could be too complex to scale using methods that incorporate objectively verifiable numbers. Meanwhile, C_3 will likely be a fuzzy number representing a ratio between 0 and 1. In theory, a larger cost index should decrease the specific asset index (SAI), which is defined as the product of C_1, C_2, and one minus C_3 of an asset *j*. Intuitively, the summation of all SAI's across all *n* assets will be referred to as the net asset index (NAI). Finally, the total MAEROS index is the product of the NAI and C_4 criterion.

Determining an effective tool that calculates the relative dominance of two or more countries is more than just comparing the number of assets they possess. Instead, understanding a country's power should be a culmination of quantitative and qualitative factors. This study aims to develop a unique formula that accomplishes this goal of being as objective and comprehensive as possible. Furthermore, the index should reflect the current state of a country's aerospace assets, providing logical insight into the strengths and weaknesses they possess.

Predictions and Expectations

Given the expected equation above, some hypotheses can be made on the current differences between the US and the PRC. As for C_1, we can hypothesize that the US surpasses China based on publicly available data on each arsenal's number of aerospace assets. The USAF alone has more aircraft than all of China's military branches combined, which is a fact that remains undisputed (IISS, 2025).

Likewise, the performance criterion, C_2, of assets likely favors the United States most of the time. Based on the historical background emphasizing US innovation in aerospace aviation and manufacturing, the US remains the most experienced in aircraft design and performance. Its industry remains larger than any other in the world based on the vast scale of quality research and production. Therefore, it would be unsurprising to see the US outperform the PRC's assets. The PRC's industry, although rapidly growing, remains underdeveloped compared to the US. This notion is reflected in the relatively small output of its aerospace market.

Although the quantity and quality criterion of the MAEROS index is likely to favor the US, the PRC would likely outperform the US during the analysis of C_3 for each specific asset in their respective arsenals. This prediction is largely founded on the PRC's greater purchasing power. The Center for Economic and Policy Research finds that the purchasing power of the US was surpassed by China in 2014 and is projected to be 40% larger by 2028, with data presented by the International Monetary Fund (CEPR, 2023). In addition to China's lower wages and strong centralized government, which drives potentially lower production costs, the PLA could boast a potentially more affordable arsenal than the US, despite having lower quantity and quality specifications. In contrast, the high cost of American aerospace assets is driven mostly by price gouging from increased monopolization of defense contractors. In addition to this practice, wages for maintenance and production are significantly higher than in the PRC, even with a budget over three times greater. Affordability is a critical factor in a nation's military, and overspending is becoming a foreseeable problem for the US.

Finally, the notion of affordability provides a foundation for predicting the strategic effectiveness criterion (C_4) because costs are reflective of policy and management. Not only is overspending an issue of cost and affordability, but it is also indicative of a major flaw within the US military and industrial complex. This is a major theme that is expected to reemerge during the literature review, analysis, discussion, and conclusion of this paper. A cost-ineffective arsenal negatively impacts the readiness of any military. While this is less of a problem for security strategies focused on deterrence, this would be a significant disadvantage for an active conflict. Losses in conflict would add significantly when considering normal operational and logistical costs.

This is not to say that the PRC will have a better effectiveness criterion than the US. While all of the above are predictions based on personal perception of publicly available information, it is still possible that the PRC also has an overspending problem that reveals flaws in its policy and management, in a similar fashion to the US. However, the one known source of predictable ineffectiveness of China's aerospace arsenal is the lack of modern conflict experience. Unlike the US, China has remained relatively less engaged in conflict. Although the PRC has its fair share of skirmishes with its neighbors, it has not had the same opportunities as the US to exercise the full extent of its capabilities in combat that would allow for significant internal development. Thus, it remains unclear to what extent China's national security strategy can be fulfilled by its current status and projections.

The internal weaknesses of the US and PRC certainly extend more than the topics discussed here, as more will be reviewed in Chapter II. With that in mind, although these are just some of the expectations, some of these predictions may be true while others may be incorrect. However, these predictions provide a basic foundation to hypothesize an overall MAEROS index score comparison. While one can presume that the US outperforms the PRC, given the quantity and performance of its aerospace assets, it is possible that the US does not have the purchasing power to advance the PRC. If the discrepancy between cost and strategic effectiveness is small enough, the United States will have a larger MAEROS index than China.

Chapter II - Literature Review

To determine the necessary variables to compute a final MAEROS index, they first must be defined and weighed appropriately. This involves an extensive literature review and analysis of the four different criteria. The first section of this literature review analyzes the politics of the United States and the People's Republic of China, providing essential background on their relations, interests, and strategies. This is done from an alarmist perspective, which best anticipates the greatest extent of military readiness and concern. The goal here is to understand their respective policies and the reasoning behind conflicts. The second section discusses systematic and institutional weaknesses of either country that impede aerospace assets from obtaining objectives, gathering relevant information that will be relayed and defined as $C_{4,}$ and whether it can be determined as a numerical operative. The third section of this literature review foregoes information to determine a numerical ASI and develop methodologies. The goal is to formalize the ASI portion of the MAEROS index by investigating methods to define quantity, technological performance (based on engineering principles), and cost-effectiveness in numerical operatives that accurately portray a reflective score of a specific asset.

Competing Interests, Policies, and Strategies

The People's Republic of China

The interests of the People's Republic of China have been molded by legitimizing the narrative of the "Century of Humiliation," according to China analyst Alison A. Kaufman, which refers to the 110 years between the start of the First Opium War in 1839 and the PRC's founding in 1949. During this period, the Qing Dynasty was weakened by foreign powers. This period in history shocked the Chinese worldview, introducing a debate on how China needed to evolve to survive external and internal pressures. On one hand, some thinkers and scholars encouraged China to adopt Western ideas, while others argued for independence. The latter "allows China's government and people to interpret contemporary successes through the lens of failures" (Kaufman, 2011, p. 4). This notion exists today in the form of persistent insecurities that resonate within the psyche of the Chinese Communist Party (CCP). One critical loss remains in China's control over territory from its peak during the Qing dynasty. Although the PRC has reasserted control over Tibet, Xinjiang, Hong Kong, and Macau, its inability to reannex Taiwan has been especially troubling to fit the narrative. According to Kaufman, "the view is nearly unanimous that the losses of Century of Humiliation will not be fully rectified until Taiwan is returned to the mainland" (Kaufman, 2011, p. 5).

Although China would prefer to obtain Taiwan through peaceful means, Chinese President Xi Jinping has not ruled out the use of force, which is critical in determining the calculus of the PRC's military interests. If peaceful reunification is not achieved under Xi Jinping, some argue that Xi will still honor his commitment to reunify with Taiwan by forceful means. Major Kyle Amonson of the US Army and retired Captain Dane Egli of the US Coast Guard argue that the possibility of an invasion of Taiwan could come as soon as 2030, according to their thesis, *The Ambitious Dragon* (2023), published by the Journal of Indo-Pacific Affairs. According to them, the window of opportunity is between 2027 and 2030, which is derived from Xi's cult of personality, the PLA's defense modernization deadline of 2027, and Chinese age demographics, painting Xi's life expectancy. Although their argument is significantly dependent on Xi's desire to cement his legacy, which could come at a political cost, it underscores the PLA's centenary modernization goals that coincide strongly with Xi's ambitions for national rejuvenation by 2049, coinciding with the 100th anniversary of the PRC. As previously stated, rejuvenation would be incomplete without reunifying Taiwan with the mainland (Amonson & Egli, 2023).

Nonetheless, Taiwan remains the PRC's main national security and military interest. China has increased its military presence in the Taiwan Strait and South China Sea, creating man-made islands in the latter location to project its strength in the region and deter foreign interference. According to Amonson and Egli, "These actions are consistent with Xi's statements at the National Congress of the Communist Party and is a reflection of China's intent to take aggressive military action, in direct violation of international law, to expand Beijing's regional sovereignty" (Amonson & Egli, 2023, p. 49).

Thus, China's policy of reunification with Taiwan remains double-sided. China adheres to peaceful reunification by allowing for a "one country, two systems" doctrine, which maintains and expands combat readiness through the modernization of the PLA. This is the cornerstone of the PRC's policy, though aerospace readiness and modernization remain the main concerns of this thesis. According to China's Aerospace Studies Institute, one step toward modernization includes promoting innovation in defense science and technology, such as developing high-tech supercomputers. Another step would be commissioning new weapons, such as J-20 fighters and DF-26 intermediate to long-range ballistic missiles (China's Aerospace Studies Institute, 2019, p. 23).

However broad modernization is, preliminary results show that the PLAAF's combined inventory of modern Chengdu J-10C, Shenyang J-16, and Chengdu J-20A combat aircraft was over 600 in 2022, up from over 200 in 2018, according to the International Institute for Strategic Studies (IISS, 2023) These more sophisticated aircraft are slowly phasing out older aircraft as part of the PRC's military modernization policy to compete with any foreign adversaries, including the United States. Ultimately, these motivations, interests, policies, and strategies underscore fundamental goals for China's Central Military Commission (CMC). Furthermore, they help understand the immediate extent of such military goals, which are regionally situated in East Asia. China's military capability to tackle separatist forces in Taiwan and establish bases across man-made islands in the South China Sea remains its main military priority.

The United States of America

The United States has maintained a military presence in the Indo-Pacific since the 1800s, especially since the end of World War II. Today, the US maintains strong military alliances in the Indo-Pacific, which are crucial to carrying out its political and economic sphere of influence. Although the military's interests are strongly motivated by core values such as navigational freedom, unrestricted trade, and peaceful cooperation, its ultimate motivation is to exist and remain unchallenged by opposing actors, including China. This notion is especially true despite America's relatively ambiguous and inconsistent policy.

On the other hand, isolationist policies have become especially prevalent under the administration of President Donald J. Trump. These opposing approaches highlight conflicting policies that can impact our allies' sense of economic, political, and military security, which indirectly affects the aerospace sector. For example, President Trump's extensive threat of tariffs on NATO countries to bring about economic pressure has led to backlash from the bloc, such as Portugal's withdrawal from the F-35 program (Aviation24, 2025). Furthermore, Trump's announcement of 25% tariffs against the PRC, South Korea, and Japan automakers comes with the hope of bolstering domestic production. This action has only led to a joint response by the three countries and could lead to further retaliation that endangers aerospace markets (Reuters, 2025).

Furthermore, the United States has been ambiguous on direct security matters such as defending Taiwan. While this ambiguity can be a strategy of itself, because it does not directly conflict with the PRC's one-China policy, it also fails to send a clear message about America's true intentions. For instance, Former President Joe Biden had once stated that US forces would defend Taiwan in case the PLA invades (BBC, 2022). However, President Biden also promoted onshore semiconductor manufacturing by passing the CHIPS Act. This could undermine Taiwan's security, derived from its renowned semiconductor industry. More recently, President Trump has declined to comment whether the US would commit to Taiwan's defense if the PRC invades (Focus Taiwan, 2025), further underscoring a lack of national security clarity.

In the meantime, the United States still enjoys significant economic, political, and military leverage that enables it to maintain its allies to a great extent. Consequently, many of its allies, particularly in East Asia, depend on American aerospace research, development, and manufacturing. A simple internet search reveals that the majority of military aircraft belonging to South Korea, Japan, and the Philippines were made by the United States. However, it remains unclear how this relationship will develop given the ambiguous and inconsistent nature of American policy. Based on this inquiry, a complete MAEROS index must consider the ambiguity of America's potential policies, ranging from isolationism to interventionism.

Determining the Weaknesses of Competing Strategies

"For the purposes of this report, military weakness can take three forms: (1) outright inability to perform a mission, (2) high risk of mission failure, or (3) inefficiencies that degrade mission outcomes." (RAND, 2015, p. 2).

Potential Chinese Weaknesses

The PLAAF suffers from the same institutional flaws seen in all branches of the PLA. First and foremost, the PLA suffers from corruption throughout all ranks of the military. Corruption has been at the forefront of President Xi's campaign to purge even high-ranking officials. For instance, former lieutenant general Gu Junshan, who had served for the PLA since 1971, was sentenced to death for pocketing less than $1 million in bribes (NY Times, 2014). Although his sentence was later suspended and commuted to life imprisonment, this case led to the fallout of other high-ranking officials such as Guo Boxiong and Xu Caihou, both vice chairmen of the Central Military Commission, and many more. More recently, He Weidong, also a vice chairman of the CMC, is under anti-corruption investigations as of April 2025 and has since been removed (Financial Times, 2025). These cases reflect a few of many part of the systematic corruption rampant in China's military and related institutions.

While corruption is not unique to China's military, some would argue that "corruption in the military is so pervasive that it could undermine China's ability to wage war" (The Guardian, 2014). For instance, promotions paid for by bribes poorly reflect the performance of officials. During a potential conflict, such appointees can fail to properly execute mission tasks and undermine the readiness of the military as a whole. Additionally, corruption degrades military discipline by encouraging unethical behavior and attitude. This practice dismantles trust and appreciation between commanding officers and lower-ranking members. Lastly, misappropriation of expenses redirects funds away from what is needed by the military; thus, it is unlikely that the defense budget portrays the full extent of China's military capabilities. (Au, 2019, p. 301-309).

Aside from institutional corruption, the PLA's aerospace assets have historically lacked substantial modern aircraft. Although significant progress has been made, training remains inadequate, and actual combat capabilities remain to be seen. China has not been engaged in a war in decades, so much of its modern military experience is based on theory, training exercises, and observation. Additionally, China is largely restricted from performing joint air exercises with many other nations that operate American aircraft, such as Pakistan, without the consent of the US due to national security issues (Kumar, 2024). This is another example of how China's isolated aerospace industry, a notion further emphasized by the fact that China has sought technical training from Western pilots, such as former US Marine Daniel Duggan, who was accused of training Chinese military pilots (CNN, 2023).

Additionally, Chinese hackers have repeatedly stolen data related to fighter programs, like the F-35, in 2007, 2012, and 2014, according to the Center for Strategic International Studies (CSIS, 2023). While the motivation(s) behind these acts are unclear, speculation that the PRC is trying to imitate American products and innovation is nothing new. Although they may be partially or entirely unfounded claims, they still have serious implications for national security. While espionage is a fairly common practice between competing nations, these instances could reflect Chinese reliance on stealing aircraft data as an admission of technological incapability on behalf of the PRC.

As China's defense industry has grown, the monopolization of the defense industry remains a critical problem. China's defense industry remains closed from the outside world, and the few that dominate have little incentive to compete against one another. This leads to a decline in innovation, weakening the technological stance of the PLA's aerospace assets. This issue is further exacerbated by the CCP's excessive departmentalization, which is intended to promote secrecy. Therefore, there exists a "lack of strong ownership that is crucial to ensuring that projects can succeed the thicket of bureaucratic red tape and cutthroat competition for funding" (RAND, 2015, p. 127-128). While China's defense industry is not unique to this issue, its intent at maintaining secrecy discourages transparent pricing for weapons systems and reduces publication of corruption investigations (RAND, 2015, p. 130-131)

The weaknesses inside China's military have cast doubts about the PLA's readiness and ability to take Taiwan; in fact, the West exaggerates about its significance to the CCP. While the reunification of Taiwan is ideal, a significant amount of the CCP's effort is spent on keeping the regime alive and stable through indoctrination. This is a fundamental rationale for any regime–to maintain its survival, which undermines the argument from the writers of *The Ambitious Dragon*. Instead, taking over Taiwan requires the CCP's influence and the PLA's readiness to remain stable. The regime's survival could undermine President Xi's vision of rejuvenation driven by his cult of personality, delaying the window of opportunity to fix Taiwan's status indefinitely. In a nutshell, "keeping the PLA focused on the mission of ensuring CCP rule, paradoxically, thus remains China's best option for Taiwan" (RAND, 2025, p. 17-20).

Potential American Weaknesses

One critical weakness of the US military, which affects aerospace assets, is the overspending and waste of the budget, driven by many factors. For one, the military-industrial complex (MIC) influences the pricing for many weapons systems and development, leading to overpricing. According to Senator Elizabeth Warren of Massachusetts, "loopholes in current acquisition laws make it nearly impossible for the Department of Defense to obtain the data necessary to prevent price gouging" (Stop Price Gouging The Military Act, 2022). Warren cites an investigation from the Project on Government Oversight, claiming that Boeing charged up to

177,000 percent for spare helicopter parts for the Army (POGO, 2011). Boeing is the fourth-largest contractor to the Department of Defense (DoD) during the 2023 fiscal year, accounting for $20.1 billion (DoD, 2023). Such cases emphasize a lack of pricing transparency inherent in the MIC, raising the question of how much money is overspent at the expense of taxpayer dollars and the military's overall fiscal readiness.

Misutilization of such funds provides another explanation for the wastefulness in military spending. An argument to be made is that the military and its assets, including aerospace-related, should redirect spending to improve quality over quantity. Increasing the number of aircraft redirects funding from readiness resources, which can be as low as 80% of preferred levels in the Air Force. For example, the DoD "approved about $1.9 billion for additional F/A-18 aircraft—a venerable plane that would likely not survive long against either Chinese or Russian air defenses," adding, "with a defense strategy appropriately oriented toward China and Russia, it is challenging to make the case for buying more non-stealthy 'fourth-generation' aircraft like the F/A-18" (Miller & O'Hanlon, 2020, p. 6-7). Instead, funds should be allocated towards repeatedly modernizing the fleet by investing in new technologies.

Moreover, limited munitions inside the US military and slow production capacity underscore another weak point. The war in Ukraine against the Russian invasion has prompted a swift and united NATO response. Nations within the bloc, including the United States, have provided ammunition to prevent Kyiv's capitulation to Moscow. As the war prolongs with no end in sight, munitions stockpiles in the US have decreased, diverting resources from potential conflict with China. Critical munition shortages, such as 155 mm-caliber shells, underscore a lack of production capacity, undermining military readiness (CSIS, 2022). Similarly, military recruitment is declining, with the USAF missing its goal by more than 2000 people in 2024, which is crucial against the PRC's much larger manpower (Sisk, 2024). While efforts are underway to curtail these equipment and personnel shortages, they nonetheless highlight a potential shortcoming that would weaken the US MAEROS index.

Determining Efficacy (C_4)

Given some of the weaknesses that undermine each country's efforts to pursue its respective interests, each military is operating at a suboptimal level compared to its full potential. Thus, C_4 could be represented as a score from 0 (0%) to 1 (100%). In a theoretical, ideal scenario, the efficiency of command translates 100% to its respective assets. However, assuming perfection does not exist in practice, C_4 could never be 100%. After analyzing each country's background and shortcomings, this value is to be determined by a reasonable opinion. Given the fundamentally subjective nature of this coefficient, it is especially prone to bias. Thus, C_4 should be responsibly treated as an adjustment coefficient to the sum of all specific asset indices, reflecting all aerospace assets. Since this paper aims to achieve objective results, C_4 will be left as a scalar for the reader to judge based not only on the information provided, but also the ever-changing political landscape.

Developing the Specific Asset Index

The specific asset index of the MAEROS score quantifies the quantity (C_1), quality (C_2), and cost (C_3) of a military's aerospace assets. Quantity is defined simply by the number of a specific asset owned (i.e., the United States has 185 F-22 fighters as of 2025) (IISS, 2025). On the contrary, quality pertains to specific performance characteristics that are fundamental in engineering and technology. Quality can be as detailed or ambiguous as the available public data provides. Lastly, like quantity, the cost criterion is also a single fixed value. However, a higher value should negatively impact the MAEROS score, reflecting that higher-cost assets represent higher liabilities.

Determining Quantity (C_1)

Determining C_1 is not difficult thanks to the International Institute for Strategic Studies, or IISS. This reputable think tank publishes an annual report on every country's military arsenals, including aerospace assets. These assets are reported by their numbers and roles, allowing quantitative data to be easily collected. If numbers are not exact, the report explicitly states their reasonable estimates based on verifiable data and analysis. Thus, *The Military Balance 2025* by the IISS remains the main source for the quantity criterion for this study.

Determining Quality (C_2)

On the other hand, C_2 is more difficult due to the ambiguity and availability of data online. Some information, such as an aircraft's radar cross-section, indicative of its stealth, is much harder to discover, due to the sensitive nature of this intelligence. Other information, such as an aircraft's top cruising speed, is relatively easy to find, though it is unclear how much of the data online has been verified. This lack of verification is underscored by varying values from one source to another by somewhat significant magnitudes. For instance, the US Air Force claims that the F-16C/D variant can reach top speeds of 1,500 miles per hour at altitude (USAF, 2021). However, F-16.net claims the same variant can approach 1,353 miles per hour at altitude (F-16.net, 2025). This leaves many questions and possible theories on why such a discrepancy exists, such as the following:

1. One theory for this type of discrepancy is the variability of variants. In this case, the F-16C/D can come equipped with two different engines, indicating that not all aircraft are

identical. As the USAF points out, the F-16C/D can be equipped with either Pratt and Whitney F100-PW-200/220/229 or General Electric F110-GE-100/129 engines (USAF, 2021). This largely depends on whether the aircraft has been upgraded and the year or block of the aircraft's manufacturing, which is not specified.

2. A second theory for this discrepancy is the inconsistency between testing and flight conditions. The F-16C/D maximum cruise speed depends on meteorological conditions during flight rather than design and performance alone. Such conditions include, but are not limited to, tailwinds, headwinds, crosswinds, air density, barometric pressure, and temperature at altitude. Furthermore, it is also unclear how each source defines each speed at altitude; for example, F-16.net states the max speed occurs at 40,000 feet above sea level, while the USAF does not explicitly mention. Altitude can affect an aircraft's performance, given varying atmospheric conditions.
3. A third possible theory is the lack of reputability or credibility that either source may have. While the USAF could be more credible, it may also be subject to confirmation bias in an attempt to boost its product strength. Likewise, F-16.net does not fall under a category that would label it as a vetted, scientific, or scholarly source. Thus, its only credibility is based on the relative consistency of the data it provides to other sources with similar information, such as the USAF's website.

One or more of the theories above could explain the relative inconsistency between information and sources. This lack of specificity presents a major limitation of the information in this thesis: the accuracy and precision of the technical data presented. One mitigation strategy for this issue is to review multiple sources rather than one or a few. Discrepancies between sources will continue to exist, but the data they present should be relatively consistent with one another at a minimum. With this practice in mind, research reveals that common sources are official military webpages, catalog websites (OE Data Integration Network), news articles, and occasional technical documents. Across different platforms, some of the most consistent information that could be found about an aircraft's performance includes:

- Propulsion/power data (engine type, thrust)
- Range
- Service ceiling (maximum altitude)
- Maximum speed
- Rate of climb
- Weights (empty, payload, maximum takeoff, etc.)
- Dimensions (length, width, height)
- Armament
- Year of introduction

Nonetheless, the criteria listed above provide fundamental quantitative data that can describe an aircraft's relative performance and quality. For instance, an aircraft's relative weight implies its maneuverability, power, and aerodynamic efficiency. An aircraft's weight makes reasonable inferences about the technological advancements in aerospace structures design and manufacturing, as lighter and stronger materials are generally preferred. Modern and technologically advanced aircraft are more likely to utilize a hybrid of composite materials and lightweight metal alloys rather than the latter alone. Moreover, an aircraft's year of introduction provides a basic understanding of its modernity. A higher modernity generally implies up-to-date and more advanced avionics technology, a performance metric that is not explicitly quantified by a single metric.

Determining Cost (C_3)

Similar to quality, C_3 remains highly ambiguous due to the lack of public data that precisely and accurately monitors the accounting of aerospace projects within militaries. Cost also has different meanings, such as unit cost, maintenance costs, labor costs, and repair costs, the last three being more continuous due to their upkeep. While continuous costs have a greater representation of the true liabilities an asset may have, finding this information is obscure and limited, exceeding the scope of this project. Conveniently, the DoD publishes the hourly rates of operation for all its aircraft throughout different military branches through their fiscal reimbursable rates report. However, the number of operation hours that pertain to each aircraft is not publicly available. To add more inconvenience, the PRC does not publicize routine costs.

In contrast, finding the unit cost is more readily available, though exact numbers can vary between sources, with most sources being estimates. While unit cost does not have the same continuity, it still represents the immediate price of an asset reflected by its value. For instance, modern Chengdu J-20 jets hold more value than an old Shenyang J-8; thus, it is reasonable for the former to have a higher price tag. Intuitively, losing a J-20 would have a greater impact than losing a J-8; thus, the liability of the former would also be greater. Due to the availability of estimated unit costs and its ability to properly define a measure of liability, it remains a useful quantitative measure for the MAEROS index.

Furthermore, the impact of costs can be relative, depending strongly on the country's purchasing power. Purchasing power reflects the cost-effectiveness of assets relative to a country's military budgets and expenditures. This notion can be enhanced by the purchasing power parity (PPP) concept in economic theory, defined as "rates of currency conversion that aim to equalize the purchasing power of different currencies by eliminating the differences in price levels between countries." (OECD, n.d.). Thus, for a better understanding of the relative impacts of cost, this study will utilize the estimated PRC's PPP to the US dollar.

Accounting for PPP, the American Enterprise Institute adjusted China's military budget to $710.6 billion for the 2022 budget of $229 billion, which is over a 200% increase. In contrast, the American defense budget, exclusively by the DoD, was $742.2 billion (AEI, 2024, p. 9). However, researchers from the Texas National Security Review argue that these estimates are exaggerated, instead claiming the PPP of China's military is $471 billion for 2024, which is still more than double the announced budget, but significantly less than the previous estimate This overestimate is likely due to a failure "to use sector-specific PPP for technology and equipment, leading to an inaccurate assessment of total defense spending." (TNSR, 2024, p. 48-50). Nonetheless, while the conservative estimate could be more accurate, this study should take note of this discrepancy and its effect on the quantification of C_3.

Chapter III - Calculating the Net Asset Index

After researching, reviewing, and analyzing the available literature and data needed to establish an index, the following chapter discusses the experimental portion used to quantify the *net* asset index of the overall MAEROS index. While some outcomes are to be expected before the literature review, this chapter focuses on revised specific methodology, results, and analysis by applying the research data on all fixed-wing multirole (FGA) and fighter (FTR) aircraft within the US and PRC militaries. By applying quantity, quality, and liability as factors of efficiency, the resulting information should provide useful information that compares the relative superiority of either military's FTR and FGA aircraft.

Methodology

As planned, this study's unique index equation (recall page 7) will determine the overall MAEROS score of either country's multirole and fighter aircraft. The main theory behind the function of this equation relates to a fundamental principle of efficiency, where the net efficiency performance of a system is the product of internal efficiencies. Each criterion is essentially an efficiency or performance score. However, now that specific data is recovered on each country's aircraft, the criterion can be defined quantitatively. This data can be accessed in Appendix A.

$$\text{Net Asset Index of Country “A”} = \sum_{j=1}^{n} [C_1 \, C_2 \, (1 - C_3)]_j$$

C_1 will simply be the quantity of a specific asset (*j*), determined by the data provided by the International Institute of Strategic Studies. For instance, the US owns 87 Lockheed Martin F-35C jets, where 87 is C_1, while the specific asset is the F-35C (IISS, 2025).

C_2 is a combined score of different performance metrics publicly available for a specific asset. Each of these performance metrics is normalized to the highest-scoring asset of that metric, across all aircraft from the US and China. For instance, the highest thrust-weight ratio (T/W) across all FGA and FTR aircraft is the Shenyang J-15, which sets the benchmark with a perfect score of 1.000. In contrast, the F-35C has a T/W of 0.598, which is 65.8% of the T/W of the J-15, thus earning a score of 0.658 (Lockheed Martin, 2023). This normalization is applied across six of seven different performance metrics, which are described in Table 1 below, along with the normalized scores of the F-35C and each category's top benchmark as an example. These metrics were largely chosen in fact due to the restriction of other data, such as radar cross section, a key indicator of an aircraft's stealth capability.

Table 1 - Performance Criteria of C_2 (Data from ODIN, IISS)

Criteria	**Description**	**F-35C**	**Top Contender**
Modernity Score (14.29%)	Quantifier of the asset's age, which expresses its recency and implies the implementation of newer technologies. Calculated by subtracting the asset's introduction year from the current year (2025), thus does not utilize any normalization. The difference is then subtracted again from 100 to emphasize a modernity limit of one century, and multiplied by 0.01 to convert into a score.	Introduced: 2019 Calculation: 0.01*(100 - (2025-2019)) = 0.94	Aircraft: Boeing F-15EX II Introduced: 2024 Calculation: 0.01*(100 - (2025-2024)) = 0.99
Max T/W Score (14.29%)	This score describes the thrust-weight ratio of an asset. A higher T/W implies higher propulsive performance while maintaining a lower weight profile, enabling better mobility and maneuverability in flight. Calculated by dividing the maximum dry thrust (with afterburner, in lb-force) by the aircraft's maximum takeoff weight in pounds, as seen in Appendix A. The value is then normalized.	T/W = 0.598 lbs/lbs Normalized = 0.658	Aircraft: Shenyang J-15/T T/W = 0.909 lbs/lbs
Max	This score describes the largest payload	Max Payload	Aircraft:

Payload Score (14.29%)	allowed for an aircraft. Higher payloads demonstrate higher weapon capabilities and fuel storage for longer endurance. Calculated by subtracting the aircraft's empty weight from its maximum takeoff weight in pounds, as seen in Appendix A. The value is then normalized.	= 36232 lbs Normalized = 0.735	McDonnell Douglas F-15 E Max Range = 49300 lbs
Max Range Score (14.29%)	This score describes an aircraft's maximum possible ferry range, proportional to its combat range. This number is directly derived from available data, as shown in Appendix A. The unit used is nautical miles (nmi). The value is then normalized.	Max Range = 1200 nmi Normalized = 0.370	Aircraft: Chengdu J-20A Max Range = 3239.74 nmi
Max Altitude Score (14.29%)	This score describes an aircraft's service ceiling, or maximum altitude, in feet, given its aerodynamic constraints and performance limits. Higher altitudes demonstrate broader capabilities and sophisticated design. This number is directly derived from available data, as shown in Appendix A. The value is then normalized.	Max Altitude = 50000 ft Normalized = 0.762	Aircraft: Chengdu J-20A + Shenyang J-16 Max Altitude = 65620 ft
Max Speed at Altitude Score (14.29%)	This score describes the aircraft's maximum speed in miles per hour at an altitude of 40,000 feet. Higher speed indicates better performance and implies a higher score. This number is directly derived from available data, as shown in Appendix A. The value is then normalized.	Max Speed at Altitude = 1200 mph Normalized = 0.640	Aircraft: McDonnell Douglas F-15 C/D/E Max Speed = 1875 mph
Max Rate of Climb Score (14.29%)	This score describes the aircraft's maximum vertical rate of climb from sea level, in feet per minute. A higher ascent rate indicates greater agility and performance. This number is directly derived from available data, as shown in Appendix A. This value is then normalized.	Max Rate of Climb = 45000 ft/min Normalized = 0.653	Aircraft: Lockheed Martin F-22A Max Rate of Climb = 68898 ft/min

Nonetheless, these metrics highlight a performance comparison of different aircraft that is already overlooked by accounting quantity alone, thus enabling a better score assessment. For this study, all seven performance metrics are evenly weighed out of an ideal C_2 score of 100%, 14.29% each. The normalized score (between 0 and 1) of each metric for a specific asset is multiplied by its respective weight. The product of the normalized scores and the weight of all seven criteria is summed to determine the C_2 score. For the F-35C, this calculation is shown:

$$C_2 = (14.29)(0.94 + 0.658 + 0.735 + 0.370 + 0.762 + 0.640 + 0.653) = 67.99$$

The cost criterion, C_3, is a function of the aircraft's unit cost divided by the purchasing power parity of the respective military's budget. For instance, the F-35C has a unit cost of approximately $104.13 million, while the US military PPP in 2025 is $968 billion. The former divided by the latter provides the resulting C_3 for the F-35C, which is 0.00010757. All monetary values are evaluated in US dollars as of 2025 and account for inflation since the asset's introduction year.

At last, the resulting C_1, C_2, and C_3 values are plugged into the specific asset index equation to calculate the SAI of the asset in question. For the F-35C, as calculated below, the overall SAI is 681.82. To calculate the net asset index of all FGA and FTR arsenal of both countries, the same calculations are applied across all aircraft variants possessed by both militaries. Finally, the SAI of each asset is summed to determine the NAI of each military's FGA and FTR aircraft. Although a sample calculation for the F-35C SAI is shown below, a comprehensive spreadsheet of all airplanes, criteria, values, and calculations can be found in Appendix A. A summary layout of the MAEROS index methodology is also provided.

$$\text{F-35C Specific Asset Index} = [(87)(67.99)(1 - 0.00010757)]_{F-35C} = 681.82$$

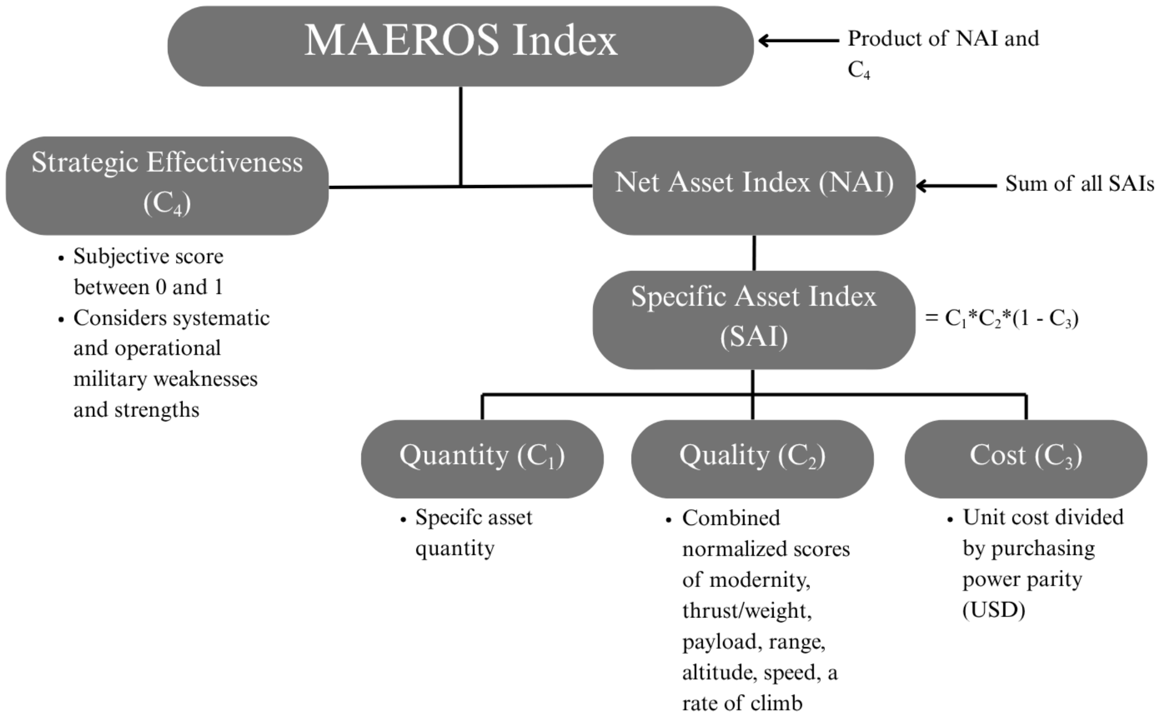

Figure A – Summary of MAEROS Index Scoring Formula

Results

Using the methodology previously stated, the United States' fighter and multirole aircraft project a net asset index score of 198,938.31. In comparison, the People's Republic of China's NAI score for the same aircraft category is 152,757.63. Intuitively, the MAEROS index score for the US is 198,938.31*C_4 and 152,757.63*C_4 for the PRC, as their respective C_4 scores are subjectively determined. Thus, the estimated power of FTR and FGA aircraft projected by the PRC is approximately 76.79% of the US. This is despite having only 1,985 FTR and FGA aircraft, or 69.55% of America's 2,854 jets, according to the data provided by the International Institute for Strategic Studies (IISS, 2025).

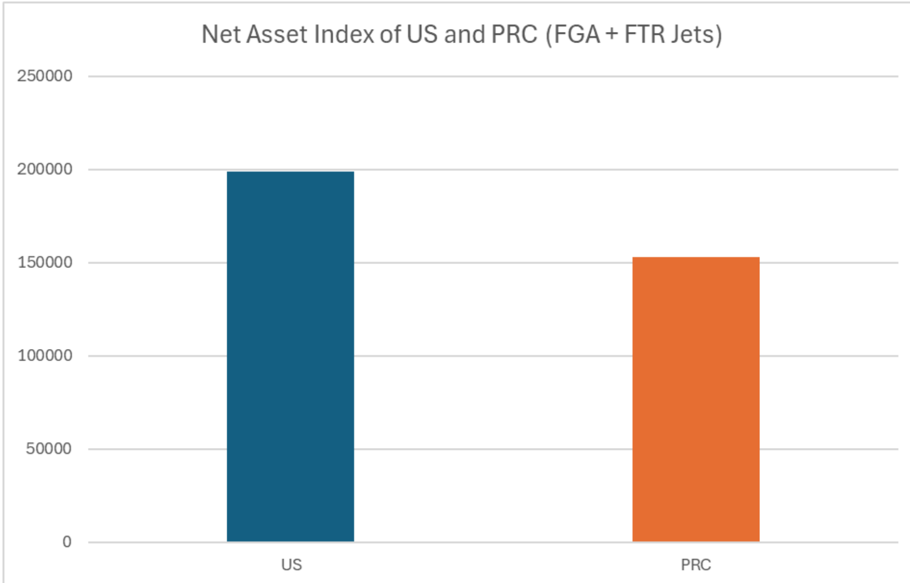

Figure B – Net Asset Indices of US and PRC Fighter & Multirole Jets

If the percentage of NAI by the PRC to the US exceeds the ratio of asset numbers alone, then the MAEROS calculator suggests that the PRC has a qualitative advantage over the US. To test this, the average scores of each performance metric from C_2 can be calculated using the equation below. Essentially, for a specific asset (*j*), the quantity of that asset (C_1) is multiplied by the normalized score of a performance metric (*x*). The sum of these products across all (*n*) assets is divided by the sum of all assets to determine the average performance score across all FTR and FGA aircraft.

$$\text{Average Performance Score} = \frac{\sum_{j=1}^{n} [C_1 * x]_j}{\sum_{j=1}^{n} [C_1]_j}$$

Given the formula above, the results explain the discrepancy between NAI and quantity-based percentages. As shown below, it is clearly shown that the PRC exceeds the US in all performance metrics except for average payload across all FTR and FGA aircraft. The greatest discrepancy of the performance metrics is underscored by the average range score, where the US lags behind the PRC by 0.1648 points. Similarly, the US also falls behind the PRC regarding the average service altitude score by 0.1614 points. For average payload, the US score exceeds the PRC by 0.0709.

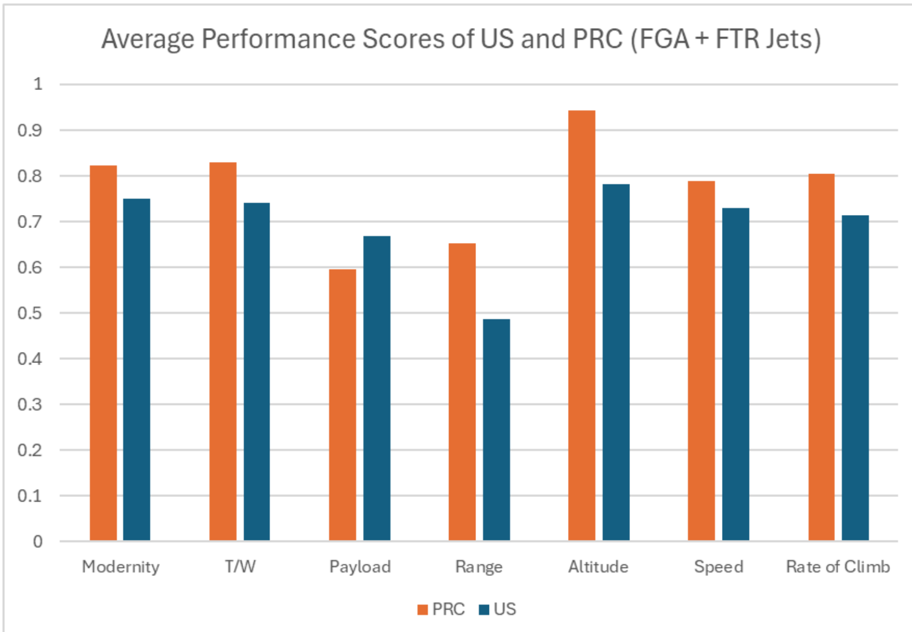

Figure C – Average Performance Scores of US and PRC Fighter & Multirole Jets

Nonetheless, the figure above proves the suggestion that the FGA and FTR fleet across the PRC is qualitatively better than the US. Furthermore, this implies that the major advantage the United States has over its adversary is perhaps based on quantity alone, a shift from the expectation that the US is technologically superior to the PRC. However, the expectation that the US remains ahead of the PRC is met by a significant margin of 2,854 to 1,985 aircraft. In terms of cost, C_3 remains relatively small, almost negligible, across all aircraft for both countries, meaning the parity between cost effectiveness and financial liabilities is undetermined.

Chapter IV - Discussion

The purpose of the MAEROS index is to utilize qualitative data to portray a more comprehensive score of power projection, one that is not based on quantity alone. So far, the results display exactly that notion, highlighting a potentially different narrative that underscores Chinese aerospace dominance over the United States, at least over fighter and multirole jets. These findings certainly have serious implications for national security, strategy, and technological competitiveness, which still need to be discussed and scaled using the final criteria, C_4. However, these implications are dependent on the validity of the data and methods in question. This study, albeit comprehensive, retains limitations that could otherwise prevent proper calculation of a truly reflective score. Nonetheless, such limitations need to be addressed to further improve the direction of this study for future research and reference.

Strategic Implications

The People's Republic of China

The specific asset index for the FGA and FTR fleet alone is good news for the PRC. As discussed in Chapter II, the Chinese strategy to modernize its military is a cornerstone of its plans for national rejuvenation. The Chengdu J-20A is a prime example of this notion, which is underscored by the aircraft's significant performance scores across all metrics (see Appendix A). The PLA's investment and expansion of modern aircraft like the J-20A has maintained the FTR and FGR fleet age at an average of 17.75 years old, compared to 25.05 years by the US. Furthermore, this not only improves the age of the fleet but also keeps its quality maintained at the highest levels.

The PRC is further bolstering its modernity and performance of fighter jets by investing in the Shenyang J-35. Although not in service, it has been introduced and flown repeatedly in public, most recently during China's International Aviation & Aerospace Exhibition 2024 in Zhuhai (TWZ, 2024). Although the aircraft is still under development and not an active member of the PLA's FGA and FTR fleet, thus not included within this study's calculations, it further exhibits China's alignment to fulfill modernization towards rejuvenation.

However, the J-20A only contributes 13.24% of the PLA's net asset index score. Collectively, the Chengdu J-10A/B/C variants all account for over 26.16% of the NAI score, while the Shenyang J-16 contributes another 17.15%. Altogether, these three aircraft account for over half of the SAI score, while the rest are split among 14 other aircraft and subvariants (see Appendix A). While this lack of power diversification has some benefits, such as simplified logistics and manufacturing, it reflects an unequal power distribution amongst assets. A monopolized or oligopolized power distribution can jeopardize the readiness and capability of an arsenal if such assets face systemic issues, though this problem is also repeated by the United States, albeit to a lesser extent.

Another notion that undermines the PLA's offensive strategy is the lack of a track record of combat experience, as mentioned previously. For instance, the J-16 has never engaged in direct combat, other than being deployed on surveillance and training missions across the Taiwan Strait (The Aviationist, 2025). Similarly, the J-20A has no combat experience either (NSJ, 2025). In contrast, the J-10C variant of the J-10 does have direct combat experience, most recently by a Pakistani J-10 shooting down at least one Indian Rafale jet (Reuters, 2025). However, a one-time confirmed knockout does not provide sufficient evidence to determine a consistent track record.

This is one of several weaknesses not reflected in the SAI of the PRC's FTR and FGA assets, in addition to systemic corruption and overdepartmentalization (see Chapter II). Additionally, the PRC remains dependent on licenses to build many of its jets, as many of its aircraft are derived from Russian design. For instance, the Shenyang J-11B/BS shares the same airframe characteristics as the Sukhoi Su-27, thus requiring authorization to manufacture (Military Watch Magazine, 2021). This is a common occurrence across many of the PRC's aircraft, further signifying a strategic shortcoming underscored by offshoring intellectual property.

The United States of America

At first glance, the NAI for America's FTR and FGA assets is troublesome from a qualitative perspective. The fact that American aircraft exhibit less desirable flight performance characteristics is a potential symptom of declining innovation, which is further caused by perhaps a decline in competition. One possible explanation can be correlated to the price gouging by the military-industrial complex, which is often dominated by the "Big Five." These include Lockheed Martin Corporation, Raytheon Technologies Corporation, General Dynamics Corporation, The Boeing Company, and Northrop Grumman Corporation, which collectively contributed $122.5 billion to DoD contracts during the 2022 fiscal year (US Congress, 2024). Competition rests mostly among these established firms, which may not be very incentivizing.

While factors like speed and range are important, flight performance is characterized by more than just the seven criteria used by this study. For instance, aircraft avionics, often referred to as the brain of the aircraft, refers to the internal hardware and software that form the backbone of an aircraft's computers. In modern warfare, a capable avionics system is key to performing missions and combat, arguably more so than physical performance. However, avionics are left out of this study largely due to the lack of available quantitative data that qualitatively describes an aircraft's sophisticated computing capabilities. Unsurprisingly, much of this information is withheld for national security reasons, though some would argue that avionics alone would make American aircraft more technologically superior. For instance, the National Security Journal acknowledges the J-20's speed and range advantage, but argues that the American F-35 is "a more versatile and advanced aircraft" due to its more advanced avionics systems (NSJ, 2025).

Apart from potential underestimating technological performance, the United States exhibits more reasoning that complements its effectiveness score. Unlike the PRC, the US has a significantly more experienced fighting record of nearly all its aircraft. For instance, the General Dynamics F-16C, which contributes 24.41% to the US's FTR and FGA net asset index, has been repeatedly tried and tested in many conflicts, including Operation Desert Storm, Noble Eagle, and Iraqi Freedom, to name a few (USAF, 2015). Additionally, the F-35 has been used by Israeli and American forces for missions across the Middle East (Simple Flying, 2024). The US strategy of using its most sophisticated aircraft complies with its ability to project strength and power, which also complements its strategic alliances, essential to projecting strength.

Research Limitations

The greatest limitation of this study is that it does not remain comprehensive enough. While it promotes a better inclusion of quantity, quality, cost, and effectiveness to calculate a relatively more complete power projection, it does not do enough to establish a high level of confidence. As previously stated, the performance characteristics were chosen largely because they were the most consistently and widely available, not because they describe everything. This study was limited to quantitative avionics, stealth, and operational data that could further enhance a more realistic reflection of the specific asset index of each country's multirole and fighter aircraft. Relying on modernity as an implication is not sufficient.

Another substantial limitation is the credibility of the data that was acquired and analyzed. While the data collected was consistent across different platforms, it still relies solely on the consistency and credibility of sources, rather than through primary, firsthand observation. In reality, much of the data could be altered from reality for different reasons, such as inaccurate reporting and bias.

A third limitation of this study is the incomplete cost index (C_3). While purchasing power parity is a strong indicator of a military's budget, relying on unit costs alone does not completely entail the liabilities of owning a jet. This is especially noted by the minuscule, almost negligible, effect that C_3 has in the specific asset index equation. Meanwhile, the program, maintenance, and operating costs of certain jets can be detrimental to the military's budget, which is not sufficiently considered in the overall equation.

A fourth limitation of this study is the methodology itself. For instance, the performance characteristics that define the qualitative criterion (C_2) are all weighed equally (14.29% each) for the sake of consistency, though this may not be the case. For FGA and FTR aircraft, a professional engineer or pilot may argue that the speed should be weighed more than payload, while another could claim otherwise. These weights can also vary depending on the aircraft's mission, which could be a ferry or combat mission, which are not inherently defined.

On a similar note, another limitation of this study is that it still relies, to an extent, on subjective reasoning. While one of the purposes of this research was to reduce this tendency, some aspects of the equation are inherently subjective, most notably the effectiveness correction scalar C_4. Likewise, determining weights across performance scores requires additional subjective reasoning that would need to be developed through further research and empirical means.

Future Research

While many notable shortcomings limit the MAEROS index, the fundamental principle that forms the backbone of the equation remains a valid theory; the net power an asset or arsenal displays is equal to the product of its internal efficiencies. This study defines these efficiencies as quantity, quality (or performance), costs, and strategic effectiveness. Each of these criteria is treated as a measure of efficiency that collectively defines an overall dimensionless score of power and strength, which is exactly what was delivered. Nonetheless, the issue moving forward revolves around keeping this numerical theory to display more reflective results. This essentially means removing and mitigating the limitations that are currently present in this study.

Above all, quantifying a performance score based on seven flight performance characteristics is not enough to claim technological superiority. While it acknowledges some strengths and weaknesses of both countries, it barely touches the surface. For true objective technological superiority, C_2 will need more extensive quantitative data, especially regarding avionics and stealth characteristics. Although performance criteria can be as detailed as the data allows, they must also be relevant and competitive. On a related note, greater access to fiscal information, accounting data, and spending permits a more fitting C_3 calculation that better reflects financial liabilities. Thus, future research and improvements can only be made wth greater access to classified, credible information.

Furthermore, changes can be made to mitigate the amount of subjectivity in this study. While a perfect absence of bias is impossible for this study, it still aims to maximize objectivity in determining power projection by using undisputed data. Achieving this purpose means researching and developing methods to quantify weights for performance metrics. One possible method of calculating performance metric weights is to perform a survey of pilots, engineers, and other aerospace professionals. In this survey, respondents can be asked to rank the importance of various performance measures such as speed, range, rate of climb, handling qualities, and more. The responses are input for a multi-criteria decision-making process that utilizes fuzzy logic, which yields appropriate weights for each performance criterion (Sánchez-Lozano et al., 2015).

However, mitigating subjectivity from the strategic effectiveness criterion, or C_4, is a much more daunting task. This score, as of now, is nothing more than a score between 0 and 1, which is determined by reasonable personal analysis, judgment, and reasoning. For this purpose, C_4 is intentionally left to the reader to define, allowing tremendous potential to shift the entire MAEROS index score. This flexibility admits to gaps in knowledge, resulting in inconsistent and nonconforming approaches. Although creating a rubric or scoring guide can encourage uniform judgment, this is still subject to bias. Nonetheless, a further investigation is needed to define strategic effectiveness as a quantitative score, although it is unlikely to be completely free of subjectivity.

Conclusion

The MAEROS index creates an objective scoring index that empirically evaluates the number, quality, cost, and strategic effectiveness of aerospace assets. This formula is fundamentally based on the notion that the power of an arsenal's assets is equivalent to the internal efficiencies. Ultimately, the MAEROS index is capable of computing a numerical score that attempts to reasonably reflect a metric of relative power projection, as demonstrated by this study's assessment of American and Chinese multirole and fighter aircraft.

Unfortunately, the data utilized in this study is largely limited due to the sensitive nature of technological documentation, creating an incomplete picture based solely on publicly available information. Furthermore, determining the strengths and weaknesses of assets is more than a matter of quantity, performance, and cost, but also one of strategic effectiveness, a notion inherently subjective to measure. Nonetheless, the MAEROS index can be improved by working in an environment with greater data availability and taking strategies to mitigate bias.

With the right tools, the MAEROS index can reveal crucial data about a country's military aerospace power. For instance, this study finds that American FGA and FTR jets are severely lacking across many performance characteristics, such as speed and range. While missing variables, such as avionics and stealth, can make up for this discrepancy, these shortcomings can still be indicative of slowing, stagnating, or declining technological capacity. Nonetheless, quantity seems to be the US's major advantage, though other non-quantifiable variables, such as its combat experience and international aerospace network, are also beneficial.

Assessments such as these are what make the MAEROS index valuable. It serves as a culmination of multiple decisions and multiple dimensions of criteria that summarize the objective strength of a country's arsenals. It can be as detailed and as nuanced as the data can permit, and can be expanded beyond FGA and FTR aircraft. Furthermore, the MAEROS index can be applied to other aircraft variants, such as bombers, transporters, and reconnaissance, to create an index of an entire military's aerospace assets. Likewise, the theory can be applied to other branches and fields of combat, including naval and ground, as long as the necessary adjustments are made. Ultimately, the MAEROS index remains a flexible and comprehensive tool that summarizes a military's aerospace capabilities by a single number.

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Appendix

Appendix A

Comprehensive spreadsheet and calculations: [MAEROS Specific Asset Index (Political Science Honors Thesis).xlsx]

- All sources for data are hyperlinked in the spreadsheet. They can also be found below
  - OE Data Integration Network: https://odin.tradoc.army.mil/
  - *The Military Balance 2025* by the International Institute for Strategic Studies: https://www.iiss.org/publications/the-military-balance/

Appendix B

Summary layout of the MAEROS index scoring formula.