Chapter 8
The Transformation and Future Perspectives of Modernized and Next-Generation Fighter Aircrafts

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ABSTRACT

This study compares next-generation fighter aircraft with modernized legacy aircraft in technical, strategic, and operational aspects. Next-gen aircraft, like the F-35 and F-22, incorporate advanced technologies such as stealth, sophisticated sensors, AI integration, and network-centric warfare, offering superior maneuverability, multi-role mission capabilities, and high strategic value. However, these aircraft come with high costs and long development times, limiting access to a few nations. In contrast, modernized legacy aircraft are cost-effective and deployable more quickly, with upgrades to avionics and radar. While they lag behind next-gen counterparts in stealth and sensor systems, they are still effective in low-threat environments. Modernized aircraft may struggle in high-threat situations compared to next-gen models. The study explores the role of these aircraft in different geographical and strategic contexts, their impact on military doctrines, and how they shape international defense strategies, with implications for military and diplomatic power projections.

DOI: 10.4018/979-8-3373-1767-0.ch008

INTRODUCTION

In recent years, air forces worldwide have been reshaped by two primary trends. On one hand, fifth-generation, next-generation fighter jets are being developed, while on the other hand, older-generation aircraft are being modernized to meet contemporary requirements, ensuring cost-effectiveness and the sustainability of existing infrastructure. These two distinct approaches have significant implications for air power projection, defense budgets, and strategic balances.

Next-generation fighter jets are particularly notable for their "stealth" (low radar visibility) technology, artificial intelligence-based systems, versatile sensor integration, and network-centric warfare capabilities. For instance, the F-35 Lightning II developed by the United States and Russia's Su-57 Felon exemplify these advancements. These aircraft are designed not merely as platforms but as comprehensive combat systems. Notably, their network-centric warfare capabilities enable seamless coordination with land, sea, and air assets, providing tactical advantages through real-time data sharing on the battlefield.

Conversely, many countries opt to modernize existing aircraft due to the high costs and extended production timelines of next-generation fighter jets. Modernized aircraft are enhanced with upgraded radar and electronic warfare systems, more efficient engines, and increased weapon-carrying capacities to align with the requirements of modern warfare. In this context, platforms like the F-16 Viper, Su-27 Flanker, and Eurofighter Typhoon stand out due to their economic sustainability and advantages in rapid integration.

These two approaches reflect not only technological preferences but also the strategic priorities and economic conditions of nations. Countries investing in next-generation aircraft typically have larger budgets and more complex military objectives. In contrast, nations prioritizing modernization often adopt a pragmatic approach to maintaining and enhancing existing capabilities. For example, major powers such as the United States and China heavily invest in next-generation aircraft, whereas countries like Türkiye, India, and Brazil emphasize modernization projects due to cost advantages.

However, both approaches come with distinct advantages and challenges. While next-generation aircraft hold the potential for long-term strategic superiority, they face drawbacks such as high production costs, lengthy development processes, and operational challenges. For instance, the F-35 program has frequently been criticized for cost overruns and delivery delays. On the other hand, modernized aircraft provide faster and more cost-effective solutions but are limited by technological constraints and structural weaknesses inherent in aging airframes.