

Literature Review On Fast Missile Ships (KCR) In The Context Of Military Modernization: A Historical Review And Challenges To Indonesia's Contribution To Maritime Defense

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Abstract

This research presents a in-depth analysis of the history and contribution of Indonesia's Fast Attack Craft (Kapal Cepat Rudal or KCR), focusing on the evolution from the first generation to the sixth generation. As an archipelagic nation with complex maritime defense challenges, Indonesia views KCR as a critical asset in maintaining sovereignty and maritime security. In the context of military modernization, this research aims to understand the impact of KCR on national defense. The applied research method is Systematic Literature Review (SLR), providing a comprehensive analytical framework for relevant literature on the research topic. A total of 80 articles were collected and analyzed, forming a strong foundation to illustrate the transformation of KCR in terms of history, technology, operations, and tactics. The research results indicate that the first-generation KCR, such as the Komar class, played a key role during the confrontation with Malaysia and various military operations. In the second generation, the Ahmad Yani class showed technological advancements and weapon system success in maintaining national security. The third generation, represented by the Fatahillah class, brought significant innovation with the use of MM38 Exocet missiles, enhancing self-defense capabilities. Subsequent generations demonstrated significant development, both in terms of technology and involvement in humanitarian and regional conflict operations. The sixth-generation KCR, recently completed by PT PAL, marks the peak of Indonesia's military modernization with automatic weapons and state-of-the-art technology. However, challenges for the seventh generation and beyond lie in rapid technological developments, increased firepower and precision, operational flexibility, cyber security, environmental sustainability, and human resource management. By understanding and addressing these challenges, it is expected that future generations of KCR can continue to be a strategic element in Indonesia's maritime defense, responding to evolving threats in the era of military modernization.

Keywords : Fast Attack Craft , Maritime Defense, Military Modernization, Maritime Strength

INTRODUCTION

In the long history of Indonesia's maritime defense, the role of Fast Attack Crafts (Kapal Cepat Rudal or KCR) has become extremely important. As an archipelagic country with more than 16,056 islands scattered from Sabang to Merauke, Indonesia occupies a unique and strategic geographic position (Pushidrosal, 2018). This geographical condition makes Indonesia one of the largest maritime nations in the world, with a vast maritime territory covering 6,400,000 square kilometers. Article 25A of the 1945 Constitution asserts that the Republic of Indonesia is an archipelagic state with the characteristics of the Nusantara, and its boundaries and territorial rights are regulated by law. In fulfilling its strategic role as a component of maritime defense, the Indonesian Navy (TNI AL), particularly through the use of warships, faces various challenges in safeguarding the sovereignty and defense of the country (Desember & I. G. K. H., 2020). Over the past few decades, the strength of the Indonesian naval fleet, including around 150 warships (KRI) such as Frigates, Corvettes, Fast Patrol Boats, and Submarines, has undergone significant changes (Hardjono, 2017).

Focusing on the dynamics of threats in the era of military modernization, Fast Attack Crafts (KCR) have become a critical asset in wartime operations (Wu, 2024). Rapid military

modernization has prompted stakeholders to evaluate the potential and challenges associated with the use of KCR in conflict scenarios. To understand the evolution and contribution of KCR in depth, a historical study of its role and impact in the history of Indonesia's maritime defense is needed. The history of KCR usage shows that the role of these ships has become increasingly vital in modern naval battles (Speller, 2018). Through historical analysis, it can be identified how KCR has adapted to changes in strategic, technological, and defense policy environments. This study not only reflects military technological achievements but also delves into the historical values that underlie the role of KCR in Indonesia's maritime defense. This research aims to deepen the understanding of the historical contribution of KCR, detailing transformations in hardware, technology, operations, and tactics. By focusing on the strategic issues that have emerged throughout the history of KCR usage, this research is expected to make a valuable contribution to designing responsive and efficient military strategies in the era of military modernization. Through historical research, it is hoped that the results of this study can provide a strong foundation for military decision-making and national defense planning in the future.

RESEARCH METHODS

The research method applied in this study is the Systematic Literature Review (SLR) method, a systematic and structured approach to collecting and analyzing literature relevant to the research topic, especially regarding the implementation of cargo parachutes as an alternative logistics distribution in isolated areas to assist victims of natural disasters. This SLR method is designed to provide a comprehensive and objective overview of existing literature, adhering to strict research standards (Szvetits & Zdun, 2016).

In conducting literature searches, keywords related to the research topic such as Fast Attack Craft, Indonesian Navy, Maritime Security, History, Military Modernization, and Maritime Defense were used. The search was carried out in both English and Indonesian, utilizing data sources from journals and research articles published between 2013 and 2023. The search process was conducted through various databases, including Google Scholar and Sciencedirect, to ensure the completeness and credibility of the acquired data.

RESULT AND DISCUSSION

Research Results Scheme or Diagram (PRISMA)

Chart 1. Describes the process of selecting articles using the Preferred Reporting Systematic Reviews and Meta-analysis (PRISMA) guidelines. A total of 80 articles were identified in the initial search phase covering the period from 2013 to 2023. After going through the screening process, 7 articles were selected, then evaluated and synthesized for inclusion in the final literature review report.

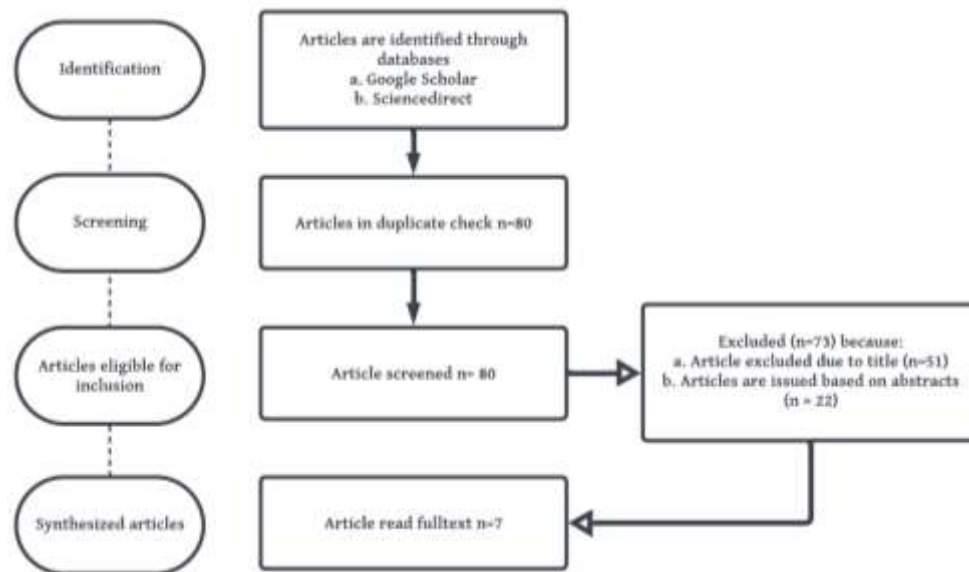


Chart 1. PRISMA Diagram

The researcher selected the obtained articles and extracted data from each article obtained from each database. The results of these articles are reviewed in relation to the Historical and Challenges of Fast Attack Craft s (KCR) Regarding Their Contribution to Maritime Defense in Indonesia.

Table 1. Previous Studies

Title and Researcher	Objective	Results
Kajian Kapal Cepat Rudal (KCR) 60m Terhadap Kondisi Seastate Perairan Kawasan Barat Dan Timur Indonesia Study On The Fast Missile Craft (KCR) Of 60 M At The Seastate Condition Of The West And Eastern (Hardjono, S, 2017)	To determine the maximum wave height that can be traversed by the Fast Attack Craft (KCR) 60M in strengthening the Indonesian Navy fleet. This determination is crucial because the operational capability of KCR 60M is greatly influenced by the wave height of Indonesian waters.	The research results show that the Fast Attack Craft (KCR) 60M can operate safely at a maximum wave height of around 4.73 meters. The average wave height in Indonesian waters is below this limit, allowing the KCR 60M to operate throughout the year, except in December and January in the northern region bordering the South China Sea, which may pose operational challenges.
Operasi Trikora sebagai Upaya Mengembalikan Irian Barat ke Wilayah Negara Kesatuan Republik Indonesia. (Bupu, T. N., & Sumarjiana, I. K. L. 2021)	To understand the Trikora Operation process in an effort to restore West Irian to the territory of the Unitary State of the Republic of Indonesia.	The research results show that through the implementation of the Trikora Operation as an effort to restore West Irian to the territory of the Unitary State of the Republic of Indonesia, the Indonesian nation took various steps, including diplomatic, political, economic, confrontation, and military movements.

PT PAL Empowerment Strategy as a Lead Integrator at ALPALHANKAM KCR 60 to Support State Defense at Sea. (Pujiatmoko, S., Mualim, M., & Sasongko, N. A., 2022)	To analyze the involvement of PT PAL as the Lead Integrator in the development and maintenance of the Fast Attack Craft (KCR) 60, as well as the empowerment strategies that must be implemented to support the progress of shipyard companies in Indonesia, both state-owned (BUMN) and private (BUMS), to support national defense at sea.	The research shows that PT PAL has been involved as the Lead Integrator in the construction and maintenance of KCR 60 to support national maritime defense since 2010. The design of KCR 60 is the work of the PT PAL's offspring. Although the plan until 2024 includes 16 ships, only 4 ships have been built and operated by the TNI-AL.
Analisis Pengaruh Letak Bilge Keel Terhadap Stabilitas Kapal KCR 60m Dalam Mendukung Operasi Pertahanan Di Laut (Senoaji, B., & Putra, I. N., 2020)	To evaluate the stability of the 60m KCR ship, especially in the context of the influence of the Bilge keel location on its stability.	The research results show that Model 3 has better ship stability than Model 1 and Model 2, obtaining different values of GZ and GM for each model and ship condition. Although the stability of Model 3 meets the standards of the International Maritime Organization.
Peningkatan Kesiapan Kapal Perang Republik Indonesia (KRI) Satuan Lintas Laut Militer Jakarta Untuk Mendukung Angkutan Laut Militer (Prayitno, M. E., Sudiarso, A., & Sianturi, D., 2022)	To evaluate the readiness level of the Indonesian Warship (KRI) in the Jakarta Military Sea Cross Unit (Satlinlamil), with a focus on human resources aspects (KRI Crew), platform and Sewaco conditions, fuel support, ship maintenance systems, and detailing priorities to improve KRI readiness under Satlinlamil Jakarta.	The research results show that overall, the readiness level of KRI in the Satlinlamil Jakarta environment is still not optimal. The evaluation involves several aspects, including the readiness of human resources (KRI Crew), platform and Sewaco conditions, fuel support, and ship maintenance systems.
Tantangan dan Peluang Perkembangan Teknologi Pertahanan Global Bagi Pembangunan Kekuatan Pertahanan Indonesia (Rachmat, A. N. 2014)	To analyze the challenges and opportunities faced by Indonesia in facing global defense technology developments.	The analysis results show that Indonesia still faces significant challenges, especially related to the limitations and suboptimal defense systems, especially the defense equipment owned by the TNI.

Indonesia's Naval and Coast Guard Upgrades and Jokowi's Global Maritime Fulcrum (Sambhi, N., 2017)	To evaluate Indonesia's progress in building defense capabilities in waters and implementing defense industry consolidation strategies, especially the role of PT PAL as the Lead Integrator in the KCR 60 within the scope of Defense Management.	The research presents an overview of PT PAL's involvement as the Lead Integrator in the development and maintenance of KCR 60. Additionally, this study identifies empowerment strategies that need to be implemented to enhance the progress of the shipbuilding industry in Indonesia, thereby supporting national defense in water regions.
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Source : Data Processed by Researchers, 2023

The Transformation of Fast Attack Crafts (KCR) from the 1st to the 6th Generation

The transformation of Fast Attack Crafts (KCR) in Indonesia from the First Generation to the 6th Generation depicts a significant evolution in the country's maritime defense capabilities. The first generation of KCR, represented by the Komar class, marked the initial step in the use of fast boats equipped with missiles, with Styx missiles as its main weapon in the early 1960s. Subsequently, in the second generation, the Ahmad Yani class saw significant improvements by using P-15 Termit missiles in the late 1960s, enhancing the range and accuracy of attacks. The third generation, through the Fatahillah class in the 1970s, brought innovation with the use of MM38 Exocet missiles, not only increasing offensive capabilities but also improving self-defense capabilities. In the 1980s, the fourth generation with the Clurit class introduced C-802 missiles, demonstrating advanced operational and maneuver capabilities. Moving into the fifth generation, the Sampari class in the early 2000s brought significant changes with C-705 missiles and improvements in sensor, radar, and communication systems. The sixth generation, represented by the KCR 60m Ke-6 Panah-626, is the pinnacle of Indonesia's military modernization. By adopting the latest precision missiles, this ship has advanced sensors, cutting-edge technology, and substantially increased striking power. This transformation reflects Indonesia's efforts to remain an adaptive and responsive maritime power amid the changing dynamics of global military modernization.

Fast Attack Craft (KCR) 1st Generation

The first-generation Fast Attack Craft (KCR), represented by the Komar class, has a historical journey filled with monumental contributions to building and maintaining Indonesia's maritime security (Indomiliter, 2019). During the confrontation with Malaysia (1963-1966), the first-generation KCR played a key role in facing the dynamics of tension in the region (Bupu & Sumarjiana, 2021). Its active participation in Operation Halmahera (1965) not only affirmed its reliable attack capabilities but also demonstrated strategic accuracy in safeguarding Indonesia's eastern territories (Jupriyanto et al., 2023). Additionally, the first-generation KCR was consistently deployed for patrols and surveillance in border areas (1960s - 1970s), ensuring national security, especially in conflict-prone waters. Its success in addressing potential conflicts in the South China Sea in the 1970s further strengthened Indonesia's maritime defense position in the region. The historical journey of the first-generation KCR also reflects its sustained contributions to national defense until 1980 (Indrawan, 2019). As a crucial element in maintaining stability and maritime sovereignty in Indonesia, the first-generation KCR has proven itself as an indispensable force. With its high attack capabilities and mobility, the first-generation KCR made significant contributions to securing national waters and maintaining the country's security in various situations, making its historical journey an inseparable part of Indonesia's maritime defense history.

Fast Attack Craft (KCR) 2nd Generation

The second-generation Fast Attack Craft (KCR) marks a significant contribution to Indonesia's maritime defense history, especially through its participation in various decisive military operations. In the 1980s, the second-generation KCR played a strategic role in border areas, ensuring national security and protecting the country's sovereignty. In this context, the second-generation KCR actively participated in several military operations that maintained stability in eastern Indonesia. One crucial moment was the involvement of the second-generation KCR in security crises in the 1990s (Yazid, 2009). Its rapid response speed and adequate attack capabilities made the KCR a critical element in responding to emerging threats, proving effective responsiveness in facing conflict dynamics. During this period, the second-generation KCR successfully played a central role in several military operations involving the handling of threats to maritime security and national territory. The integration of advanced radar, state-of-the-art missile systems, and improved anti-ship and anti-air capabilities contributed significantly to the success of these operations. Not only in its primary tasks, but the second-generation KCR also engaged in joint exercises and regional cooperation. Its participation in collaborative efforts not only enhanced operational readiness but also strengthened security relationships internationally. With this historical track record, the second-generation KCR becomes concrete evidence of its vital role in building national maritime security, particularly through successfully conducted military operations.

Fast Attack Craft (KCR) 3rd Generation

The third-generation KCR shows evolution and capabilities that make it a crucial element in maintaining the nation's maritime security. During this period, the third-generation KCR was involved in various essential operations, such as patrols and surveillance in border areas and the Exclusive Economic Zone (EEZ). Its high speed and the accuracy of its missile shots prove its effectiveness in maintaining the security and sovereignty of the country, especially in conflict-prone areas. The participation of the third-generation KCR was also crucial during conflicts in the South China Sea in the 2000s (Aresti, 2018). With tactical maneuvering skills, equipped with advanced sensor capabilities and weaponry, the third-generation KCR can be an effective force against potential threats in the region. In addition to military operations, the third-generation KCR is also active in regional cooperation and joint exercises with neighboring countries. This reflects its significant role in building strong relationships and maintaining stability in the region. Active participation in regional joint exercises emphasizes that the third-generation KCR not only protects Indonesia's maritime security but also contributes to the collective security stability in the Southeast Asian region.

Fast Attack Craft (KCR) 4th Generation

In the era of military modernization, the fourth-generation KCR is not only a symbol of military technological progress but also proves its reliability in various operations. In this context, the fourth-generation KCR is involved in prominent military operations, such as joint exercises and tactical maneuvers designed to test its operational readiness. The toughness of the fourth-generation KCR is evident in its contributions to humanitarian operations and disaster relief in Indonesian waters (Nugraha et al., 2020). Its quick response and mobility make it a valuable asset in emergencies, strengthening the role of the KCR not only in defense but also in assisting communities and the country in crisis situations. Moreover, the fourth-generation KCR is involved in operations that emphasize the development of anti-asymmetric warfare capabilities. Facing unconventional threats and complex modern battle scenarios, the fourth-generation KCR plays a crucial role in enhancing responsiveness and effectiveness in conflict situations.

Fast Attack Craft (KCR) 5th Generation

The fifth generation of Fast Attack Craft (KCR) in Indonesia marks a new chapter that enriches the contribution to the maritime defense history. The primary focus of this generation lies in successful military operations and technological advancements. With an emphasis on military operations, this generation has achieved significant milestones. This success reaffirms the strategic role of KCR in safeguarding the security and national sovereignty in strategically important regions. The Krakatau operation in 2015 serves as evidence of the readiness of the fifth-generation KCR in supporting humanitarian operations (Kristiyono et al., 2021). In the post-disaster situation of the Krakatau volcanic eruption, the mobility and quick response of KCR proved its utility in evacuation efforts and disaster relief. Equally important is the role of the fifth-generation KCR in Operation Natuna in 2018, where they were deployed to strengthen Indonesia's maritime defense in the Natuna Sea. The success in addressing potential threats in that region demonstrates the operational maturity and preventive capabilities of the fifth-generation KCR in dealing with maritime tensions. With increasingly sophisticated operational capabilities, the fifth-generation KCR continues to strengthen its contribution to safeguarding national waters and supporting various missions of maritime defense in Indonesia..

Fast Attack Craft (KCR) 6th Generation

The sixth generation of Fast Attack Craft (KCR) has just been completed by PT PAL and is currently undergoing a series of tests to ensure readiness and optimal performance before full operation (PT PAL, 2023). The sea trial of Fast Attack Craft (KCR) 60m-6 in early 2023 stands out as a notable achievement, following the success of its sister ship, KCR 60m-5, which achieved optimal results in December 2022. The sea acceptance test (SAT) took place over three days, from January 11 to 13, 2023. SAT aims to ensure that the ship complies with the specified technical specifications, including speed, performance, durability, and maneuverability, especially in the context of the installed main weapons.

The Chief Operating Officer of PT PAL Indonesia revealed that PAL is currently developing the design of the next generation KCR with improvements to the hull form and propulsion system to enhance the ship's agility and achieve speeds of over 35 knots. KCR 60m-5 and 6 have become the most comprehensive procurement projects, showcasing PAL's ability to integrate warship design and weapon installation into a single contract, providing added value to the company. The Commander of Task Force DN Yekda KCR 60m Ships 5 & 6 stated that overall, the performance of KCR Ships 5 & 6 is better, but there are still some points that can be improved for the development of future Fast Attack Craft variants. The success of the sea trial is expected to be a positive first step in a series of upcoming tests, including the main weapon firing test. KCR 60m-6, equipped with a 57mm Mk3 automatic cannon, marks a significant achievement in the development of the main naval weapon system (Alutsista) to support optimal naval fleet defense. Collaboration between PAL, the Ministry of Defense of the Republic of Indonesia, and the Indonesian Navy is expected to make a significant contribution to meeting Indonesia's naval defense needs. This synergy creates hope for the sustainability of the development of Fast Attack Crafts as a key element in maintaining Indonesia's maritime security.

Challenges for Fast Attack Crafts (KCR) 7th Generation and Beyond

The challenges for Fast Attack Crafts (KCR) of the 7th generation and beyond in the era of military modernization encompass several crucial aspects that need to be addressed to ensure their success and relevance amid the evolving dynamics of maritime defense. Some of these challenges include:

1. Rapid technological advancements require the next generation KCR to continually adopt the latest innovations, including sensors, weapon systems, and navigation technology. This challenge emphasizes the need for high-tech integration to enhance monitoring, detection, and response capabilities to threats.

2. In the face of increasingly complex threats, future generations of KCR must have higher firepower and better precision. This challenge involves the development and integration of weapon systems that can provide maximum effectiveness in modern battle scenarios.
3. Significant challenges also lie in enhancing the operational flexibility of KCR, including speed, maneuverability, and the ability to operate in various maritime environments. Adaptation to dynamic and diverse situations is crucial in the strategic use of KCR.
4. In the digital era, the next generation of KCR must be equipped with robust cybersecurity protection to safeguard its critical systems and data from potential cyber threats that could affect operational performance.
5. In efforts to achieve sustainability, future generations of KCR need to consider environmental aspects such as fuel efficiency, waste management, and ecological impact. This challenge reflects the need to design and operate ships with environmental awareness.
6. Classic challenges related to human resources, including crew education and training, remain critical aspects. The increasing complexity of KCR systems requires a well-trained crew to maximize potential and operational effectiveness.

By understanding and addressing these challenges, it is expected that the 7th generation and subsequent KCR will continue to be a key element in Indonesia's maritime defense strategy and be capable of responding to the evolving dynamics of threats.

CONCLUSION

The transformation of Fast Attack Crafts (KCR) in Indonesia, from the First Generation to the 6th, reflects extraordinary evolution in the nation's maritime defense capabilities. The first-generation KCR, Komar class, marked a significant milestone with Styx missile attack capabilities in the 1960s. Each subsequent generation continued to enhance striking power, mobility, and responsiveness to threats. The historical footprint of the first-generation KCR shows monumental contributions during the Confrontation with Malaysia to conflicts in the South China Sea. The second, third, and subsequent generations proved their central role in maintaining national security and contributing to regional stability through various military operations, joint exercises, and regional cooperation. In the era of military modernization, the fourth and fifth generations of KCR expanded their roles, serving not only as military forces but also as assets in disaster response and humanitarian operations. For example, the fifth-generation KCR succeeded in Operations Maccu Piccu and Krakatau, demonstrating its vital operational readiness and mobility. Meanwhile, the sixth-generation KCR, undergoing a series of tests, marks a significant achievement with the latest technology, advanced sensors, and precision weapons. However, challenges for the 7th and subsequent generations of KCR lie in adopting cutting-edge technology, improving firepower, better operational flexibility, cybersecurity protection, environmental sustainability, and human resource management. By overcoming these challenges, it is expected that future generations of KCR will continue to be a key element in Indonesia's maritime defense, addressing the evolving dynamics of threats.

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