AIRFORCE Digest

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- Cyber Warfare: The Future Battlefield for Australia
- Strategic Communication In Modern Military Operations: Integrating Lessons From The Cold War to Counter Contemporary Threats
- Maritime Terrorism in Malaysia: How the RMAF is Responding to this Emerging Threat

RMAF STRATEGIC THEMES

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FOREWORD

GENERAL TAN SRI DATO' SRI MOHD ASGHAR KHAN BIN GORIMAN KHAN RMAF CHIEF OF AIR FORCE

As the Royal Malaysian Air Force (RMAF) commemorates its 67th anniversary, we reflect with pride on over six decades of steadfast service, transformation, and excellence. It is with sincere appreciation that I thank the Editorial Board for the honour of contributing to the 18th edition of the *Air Force Digest*. This publication offers a meaningful opportunity to highlight the RMAF's continued evolution into a modern, capable air force entrusted with a wide spectrum of missions.

This collective achievement belongs not to one, but to all who have worn the uniform—past and present. I am deeply honoured to share this recognition with every officer, airman, and airwoman whose unwavering dedication, professionalism, and courage have brought the RMAF to where it stands today. Your commitment is the cornerstone of our success.

Reflecting on the past three years of my tenure, I take immense pride in the progress we have made together. The implementation of the **Capability Development Plan 2055 (CAP 55)** marks a pivotal chapter, laying a robust foundation for the RMAF's long-term transformation and readiness in pursuit of air power dominance.

In support of the supreme command's emphasis on empowering our personnel, the *Air Force Digest* continues to serve as a vital platform for the exchange of ideas, professional discourse, and knowledge enrichment. By embracing a reference-based and scientific approach while ensuring accessible and engaging content, this publication promotes critical thinking and intellectual growth among RMAF members. It also serves to connect with a broader audience, fostering mutual understanding and dialogue beyond our ranks.

The release of this 18th edition invites all readers to broaden their perspectives, stay informed on current developments, and draw valuable insights from the diverse experiences shared within these pages. I extend my sincere congratulations to all contributors for their thoughtful submissions and commitment to excellence. Your efforts continue to strengthen the professional fabric of the RMAF and inspire continuous learning.

Thank you for your steadfast service and dedication. I wish everyone continued success and fulfilment in the years ahead.

''Kuasa Udara Perisai Kedaulatan Negara''
"Sentiasa di Angkasa Raya"

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CYBER WARFARE: THE FUTURE BATTLEFIELD FOR AUSTRALIA
by COL RAZALI BIN AHMAD JUMALI RMAF

Introduction

Warfare has continually evolved with the introduction of new technologies and strategies. In the contemporary world, traditional battlefields - comprising land, air, and maritime domains are no longer the sole arenas of conflict. The rapid advancement of technology has elevated cyberspace to a critical domain, introducing new dimensions to modern and future warfare. In the digital age, much of the critical infrastructure, including military networks, financial services systems, healthcare facilities, and power plants, relies on the Internet for operation.

This dependency renders them susceptible to cyber warfare, a threat capable of disrupting essential services and damaging infrastructure. This threat vector is accessible to state and non-state actors, enabling them to advance their strategic geopolitical objectives without engaging in armed conflict.

Consider the implications of a successful cyberattack on Denmark's power infrastructure in 2023. Fortunately, the attack was detected and neutralised before significant damage occurred[1]. Nonetheless, had it succeeded, the economic and energy security consequences would have been profound[2]. Now, reflect on the potential impact of a similar or even more severe attack on Australia's critical infrastructure. The potential implications are severe, underscoring the need for comprehensive preparedness. Thus, it is imperative to question: Is Australia adequately prepared for conflicts conducted in the realm of cyber warfare, where hostilities extend beyond traditional battlefields? What measures should be implemented to ensure our readiness?.

In this paper, it is argued that the emergence of cyber warfare represents a growing threat to Australia's national security and requires comprehensive attention. It is likely to become one of Australia's future battlefields, necessitating a thorough review and enhancement of the government's capabilities, critical infrastructure, and military defences.

This essay will first explore cyber warfare's definition, scope, and rise. Subsequently, it will assess cyber warfare's strategic threat to Australia and provide a brief overview of its current state. This examination will include implications for national security, particularly concerning the vulnerability of critical infrastructure and military networks. Finally, it will discuss the necessity for Australia to strengthen its cybersecurity measures, as this represents a crucial defence against the escalating threat of cyber warfare.

The Rise of Cyber Warfare

As the nature and characteristics of warfare have grown increasingly complex over time, and as technological advancements and networked systems have accelerated, the distinction between war and peace has continued to blur. Consequently, cyber warfare has emerged as a prevalent grey zone tool utilised by nations and is potentially a factor in future conflicts.

Chwe defines cyber warfare as "the use of computer programs to attack, disrupt, destroy, disable, or steal anything of military, economic, or general strategic value or efforts to defend against such attacks."[3] Cyber warfare encompasses "espionage, sabotage, denial of service attacks, propaganda, economic disruption, and urprise cyber-attacks."[4]

An early example of severe cyber warfare targeting a nation's critical infrastructure occurred in Estonia in 2007. During this incident, banks, newspapers, and government websites in Estonia were systematically taken down, significantly damaging Estonia's digital infrastructure and economy.[5]

Beyond peacetime, cyber warfare is also extensively employed during armed conflicts. The recent war between Ukraine and Russia has demonstrated how the Russian military utilises its cyber capabilities to disrupt military communications and disseminate disinformation propaganda to undermine Ukrainian societal cohesion.[6] These examples underscore that cyber warfare has substantial implications, including data loss, reputational damage, degraded military operations and challenges to national sovereignty.

Given this context, why does it matter to Australia? In the current strategic competition between the U.S. and China, the lack of a strategic warning period before conflict[7] and the increasing likelihood of China's grey zone tactics necessitate that Australia develop robust cyber capabilities.[8] Australia's geographic advantage is no longer sufficient to shield it from global threats, particularly cyber threats. Such threats pose a long-term danger to Australia, risking disruptions to critical infrastructure, social cohesion, and the financial sector.

The Strategic Implications of Cyber Warfare for Australia

As discussed, the increasing prevalence of cyber warfare globally underscores its strategic significance, warranting high-priority attention from Australia. The implications for Australia's national security are substantial, given its reliance on digital networks for essential sectors such as finance, healthcare, telecommunications, energy, and defence capabilities.[9]

Despite advancements in cybersecurity technology, the debate regarding the efficacy of current cybersecurity measures is increasingly robust and relevant, yet still contentious concerning ways to enhance them. For instance, the current capabilities of digital networks can offer real-time monitoring and potentially mitigate cyber-attacks before they escalate.[10]

In contrast, cyber warfare evolves rapidly, often outpacing the development of defensive systems. Cyber attackers frequently employ advanced tools and strategies to enhance their capabilities, including artificial intelligence and machine learning.[11] This adaptability by attackers leaves Australia susceptible to frequent cyber-attacks.

A notable example is when DP World Australia, the nation's largest port operator, halted operations at its Sydney, Brisbane, and Melbourne ports in 2023 after detecting unauthorized access to its network.[12] Such incidents reveal deficiencies in critical infrastructure and illustrate the significant risks to Australia's economy, including financial losses, supply chain disruptions, and diminished investor confidence.

Simultaneous attacks on all critical government and commercial sectors in Australia, akin to the situation in Estonia, couldundoubtedly paralyse Australia's resilience.

From a military perspective, while Australia's geographical isolation might deter traditional military kinetic engagements, the combination of cyber warfare and ballistic missiles remains a feasible threat that must be addressed. An adversary could target an Australian hybrid satellite with both military and commercial payloads with malware, potentially disrupting military communications networks and compromising command and control systems.

The repercussions are not confined to military operations but could extend to Australia's energy sector and civilian internet access.

An example from the ongoing Ukraine-Russia conflict illustrates this threat: Russia's cyber-attack on satellites has significantly impaired Ukrainian military communication, and similar attacks have led to German energy operations losing surveillance of 5,800 wind turbines in central Europe.[13] This attack also affected thousands of individuals in Ukraine, France, Germany, and other EU countries, disrupting internet access and information availability.[14]

It is evident that cyber warfare is a potent instrument in modern conflicts, capable of undermining military operations, leading to loss of situational awareness and erroneous responses. The use of dual-purpose satellites with intricate interdependencies between military and civilian infrastructures demonstrates that cyber attackers could exploit these dual-use systems during armed conflicts to affect both military targets and civilian life, as well as the economy.

Additionally, evidence suggests that the impact of cyber warfare extends beyond national borders, influencing regional economic and political stability.

Australia's Strategy for Cyber Warfare

In addressing rising cyber threats, this section outlines Australia's strategy for cyber warfare. According to the Australian Cyber Security Strategy 2023-2030 emphasizes the development of six cyber shields to defend against cyber threats. Each shield is designed to strengthen defences and make Australia a more challenging target.[15]

The strategy aims to enhance national cyber resilience and deploy advanced cyber capabilities to counteract threats. Additionally, it seeks to improve domestic and international collaborative efforts, working with regional allies to evaluate and address cyber threats.[16]

However, existing policies remain ambiguous regarding cyber governance and suffer from a lack of cyber skills and collaboration between government and industry in managing persistent cyber threats. Furthermore, there is a need to improve engagement with global partners to enhance international standards and address existing deficiencies.[17] Therefore, the following section will analyse the strategic path forward.

The Strategic Way Forward

The final part of this paper will analyse Australia's viable alternatives for enhancing cyberspace capabilities in preparation for future conflicts. First, it is essential for the Australian government to continually upgrade its cyber infrastructure to maintain competitiveness on a global scale. Given the government's ongoing efforts to publish the Australian Cyber Security Strategy 2023-2030 and strengthen its cyber capabilities through AUKUS Pillar II, it is apparent that the cyber threat landscape is evolving in

complexity. Adversaries are persistently adapting to exploit vulnerabilities. Cyber deterrence and cybersecurity are critical for safeguarding critical infrastructure from future cyber-attacks and play a significant role in ensuring economic resilience by protecting businesses and essential services from costly cyber incidents.

However, investment in cyber capabilities may divert resources from other essential areas. While the importance of cyber capabilities is undeniable, it is crucial to consider the broader societal impact, including funding for sectors such as healthcare, education, and environmental protection. Neglecting these areas could lead to long-term adverse outcomes, such as diminished education standards and inadequate healthcare services.

Conversely, it is vital to recognize that cyber capabilities are fundamental to national security. In 2023, Australia faced numerous cyber-attacks on its critical infrastructure, as reported by the Australian Signals Directorate (ASD). The ASD responded to 145 incidents targeting critical infrastructure, such as ports, compared to 95 incidents in the previous fiscal year.[18] This increase highlights the urgent need for robust cyber defence to protect all critical infrastructure and services, including the healthcare system and educational institutions.

However, expenditure on cyber needs to compete against other enormous increases in the defence budget, such as acquiring nuclear submarines under the AUKUS Pillar I or other major acquisitions. Does Australia require nuclear submarines as part of its deterrence strategy, although China will most likely use grey zone tactics in Australia's backyard? These are no either or decisions, but the national strategy needs to consider its threat scenarios and allocate resources in a manner most beneficial to the defence of Australia.

Whilst budget reallocation is a key mechanism for funding new cyber capability, consideration could also be given to improving the nature of its cyber cooperation and skilling of its workforce. For example, Singapore conducts a national cooperative cyber exercise involving 11 critical infrastructures, known as Exercise Cyber Star, in 2023.[19] The exercise aims to incorporate the whole of government and society from various sectors to simulate responses to various cyber-attack scenarios. Australia could reap a return on investment from this type of endeavour, which fosters trust and collaboration. This undertaking is also a deterrence strategy to showcase Australia's national resilience in countering a wide range of cyber-attacks. This approach could serve as a model for Australia to benchmark against for a complete cyber crisis management.

Looking beyond Australia, as the Indo-Pacific is a new ground zero for cyber-attacks, emphasis could be given to improving international cooperation, particularly with neighbouring nations. By doing this, Australia could leverage the collective effort to share intelligence information, coordinate responses to cyber threats, and establish common cybersecurity standards. Through this collaborative approach, Australia can pave the way to a safer global cyber environment and foster a sense of solidarity by promoting open dialogue with regional partners. In return for this engagement, the regional economies, particularly in Pacific and Southeast Asia, can prosper from a more secure cyber security environment.

However, the challenges of international cooperation should not be underestimated. While international collaboration is essential for addressing shared threats, it presents challenges. For instance, countries in the region face similar levels and complexities of cyber threats but often have varying levels of security infrastructure, funding, and skills.[20]

Moreover, differing national interests and perceptions of cybersecurity threats among Southeast Asian countries result in diverse approaches to combating cybercrime.[21] These issues highlight the complexities of international collaboration and hinder efforts to establish uniform procedures and standards.

Despite these challenges, effective regional collaboration can mitigate the risk of future cyber-attacks. Australia could play a more significant role in supporting ASEAN's cybersecurity initiatives by sharing expertise, providing resources, facilitating information exchange, and harmonising legal frameworks through transparent negotiations. Such collaborative efforts could assist in understanding broader threats to cyber security and build resilience within the region.

Conclusion

Ultimately, the evolving cyber warfare landscape presents a substantial and escalating threat to Australia's national security. As this essay articulates, the risks associated with strategic competition, the absence of warning time, and the borderless nature of cyber warfare necessitate that Australia prepare for future conflicts. Failure to address cyber-attacks effectively, particularly those targeting Australia's domestic environment, poses a long-term threat to the nation, potentially disrupting essential infrastructure, social cohesion, and the financial sector.

Recognising these risks, enhancing cyber capabilities is not merely an option but a necessity for addressing the threat of cyber warfare. In light of budget constraints, Australia should consider prioritising or reassessing some of its high-cost capabilities, possibly in favour of more cost-effective and flexible platforms that offer agility and comprehensive security without imposing excessive burdens on defence and national budgets. In the digital age, a holistic approach that integrates government-wide efforts with protecting Australia's economic engines and society, along with a commitment to international collaboration, is essential to strengthening cybersecurity and ensuring prosperity, safety, and stability within Australia and the broader region.

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STRATEGIC COMMUNICATION IN MODERN MILITARY OPERATIONS: INTEGRATING LESSONS FROM THE COLD WAR TO COUNTER CONTEMPORARY THREATS

by COL NARULNIZAM BIN RAZALI RMAF

Abstract

Strategic communication has become a critical component of modern military operations. In an increasingly interconnected and digitalized global environment, the ability to align messaging, policies, and actions to influence behaviours and perceptions has never been more essential. This article explores the evolution of strategic communication in military contexts, drawing lessons from the Cold War to address contemporary challenges posed by near-peer competitors such as China and Russia. The discussion highlights the role of adaptability, technological integration, and multi-agency collaboration in ensuring strategic communication aligns military actions with broader geopolitical objectives.

Introduction

Strategic communication is an essential aspect of modern warfare, where the battle for narratives can shape the outcome of conflicts as much as physical engagements. It involves the deliberate coordination of messages, policies, and actions to achieve specific effects that advance national security objectives. Beyond combat, strategic communication has the power to build alliances, deter adversaries, and bolster the legitimacy of military operations in the eyes of domestic and international audiences.

The modern strategic environment is marked by the resurgence of great power competition, hybrid warfare, and rapid technological advancements. Adversaries like China and Russia are using sophisticated tools of influence, including cyberoperations, disinformation campaigns, and cultural diplomacy, to shape global perceptions. This requires militaries to revisit and adapt lessons from historical periods, particularly the Cold War, when strategic communication was vital in countering the ideological influence of the Soviet Union.

This article analyses historical precedents, explores contemporary challenges, and provides actionable recommendations for enhancing strategic communication in military operations.

Historical Context: Lessons from the Cold War

The Cold War was a defining era for strategic communication. Both the United States and the Soviet Union recognized the importance of influencing global perceptions through information, propaganda, and cultural diplomacy. The United States, in particular, leveraged tools such as the Voice of America, psychological operations (PsyOps), and public diplomacy initiatives to counter Soviet narratives.

For example, the U.S. Information Agency (USIA) played a crucial role in promoting democratic ideals and countering communist propaganda. PsyOps campaigns targeted adversaries with tailored messages designed to erode morale and foster dissent. These efforts were not limited to verbal messaging but extended to symbolic actions, such as the Berlin Airlift (1948–1949), which demonstrated Western resolve and humanitarian values.

The Cold War also underscored the importance of consistency between words and actions. The credibility of messages was reinforced when they aligned with observable deeds, such as providing economic aid through the Marshall Plan or supporting resistance movements against communist regimes.

Contemporary Challenges: The Rise of China and Russia

The post-Cold War era has seen the emergence of new challenges in the strategic communication landscape. Both China and Russia have developed sophisticated influence operations, leveraging technology, social media, and global media platforms to project power and shape narratives.

China's Strategic Communication Approach

China's "Three Warfares" strategy - psychological warfare, public opinion warfare, and legal warfare—illustrates its comprehensive approach to influencing global perceptions. Beijing uses state-controlled media, social media platforms, and economic influence to propagate its narratives, such as the Belt and Road Initiative (BRI) being a model of win-win cooperation.

Additionally, China's use of soft power through cultural diplomacy, Confucius Institutes, and global infrastructure projects creates a positive image of its rise. However, its strategic communication also involves disinformation campaigns and cyber activities, as evidenced during the COVID-19 pandemic, where China sought to shift blame and highlight its role as a global benefactor.

Russia's Hybrid Warfare and Disinformation

Russia has mastered the art of hybrid warfare, combining traditional military power with information operations to achieve its objectives. The annexation of Crimea in 2014 is a case study in strategic communication. Russia deployed a combination of military deception, cyberattacks, and propaganda to confuse and demoralize adversaries while justifying its actions to domestic and international audiences.

Disinformation campaigns targeting elections in the United States and Europe further highlight Russia's ability to exploit divisions and erode trust in democratic institutions. These campaigns often use narratives that are partially rooted in truth, making them more believable and difficult to counter.

Adapting Cold War Lessons for the Digital Age

To effectively counter these contemporary challenges, militaries must adapt Cold War-era lessons to the realities of the digital age. Key considerations include:

1. **Harnessing Digital Platforms**

Social media and digital platforms are the new battlegrounds for strategic communication. Militaries must develop capabilities to monitor, analyze, and influence narratives in real time. Artificial intelligence (AI) and big data analytics can play a crucial role in understanding audience sentiment and tailoring messages for maximum impact.

2. **Building Narrative Resilience**

Countering disinformation requires proactive efforts to build public trust and resilience against false narratives. This involves transparent communication, fact-checking mechanisms, and partnerships with civil society organizations to promote media literacy.

3. **Leveraging Symbolic Actions**

Symbolic actions, such as humanitarian assistance, joint military exercises, and infrastructure development, can reinforce strategic messages. For example, the U.S. Navy's Freedom of Navigation Operations (FONOPs) in the South China Sea serve as a symbolic assertion of international law and freedom of navigation.

4. **Emphasizing Multinational Cooperation**

Alliances and partnerships amplify the credibility and reach of strategic communication efforts. NATO's Strategic Communications Centre of Excellence (StratCom COE) is an example of how multilateral organizations can coordinate efforts to counter adversarial narratives.

Case Studies in Strategic Communication

1. **Operation Laser: The Canadian Armed Forces' Response to COVID-19**

During Operation Laser, the Canadian Armed Forces (CAF) effectively aligned their actions and messages to support public health objectives during the COVID-19 pandemic. Transparent communication about their role in assisting civilian agencies reinforced public trust and showcased the military's adaptability in non-combat scenarios.

2. **Ukraine's Information Campaign in the Russia-Ukraine War**

Ukraine's strategic communication during its conflict with Russia offers valuable lessons. By leveraging social media, Ukraine has successfully countered Russian propaganda, gained international sympathy, and secured military aid from Western nations. President Volodymyr Zelensky's speeches, often elivered in English and framed with universal values, have been instrumental in mobilizing global support.

Challenges in Implementing Strategic Communication

Despite its importance, strategic communication faces significant challenges, including:

1. **Complex Bureaucracies**: Effective communication requires coordination across military, governmental, and civilian agencies. Divergent priorities and bureaucratic silos can hinder unified messaging.

2. **Information Overload**: The digital age has created an environment where information spreads rapidly, making it difficult to control narratives or respond to emerging threats in a timely manner.

3. **Ethical Dilemmas:** The use of propaganda and information manipulation raises ethical concerns, particularly in democratic societies that value transparency and truth.

Recommendations for Enhancing Strategic Communication

1. Establish Dedicated Units

Military organizations should establish specialized units dedicated to strategic communication. These units should be equipped with expertise in media analysis, psychological operations, and digital marketing to counter adversarial narratives effectively.

2. Invest in Training and Education

Training programs should emphasize cultural competence, media literacy, and technological skills. Courses on AI, data analytics, and behavioral psychology can enhance the effectiveness of strategic communication practitioners.

3. Strengthen Interagency Collaboration

Collaboration between military and civilian agencies is essential for a unified approach to strategic communication. Joint task forces and communication strategies can ensure consistency across different levels of government.

4. Engage in Proactive Storytelling

Rather than reacting to adversarial narratives, militaries should adopt a proactive approach to storytelling. Highlighting positive achievements, such as peacekeeping missions and disaster relief efforts, can shape global perceptions and enhance credibility.

5. Leverage Emerging Technologies

Emerging technologies, such as augmented reality (AR) and virtual reality (VR), offer new opportunities for immersive storytelling. These tools can be used to simulate scenarios, educate audiences, and counter adversarial propaganda.

Conclusion

Strategic communication is a powerful tool for shaping the outcomes of military operations and broader geopolitical objectives. By integrating historical lessons from the Cold War with innovative approaches tailored to the digital age, militaries can enhance their ability to influence, deter, and compel adversaries.

The challenges posed by China and Russia require a comprehensive and adaptive approach to strategic communication, emphasizing transparency, resilience, and collaboration. Investing in strategic communication capabilities will be crucial for navigating the complexities of modern conflict and maintaining an informational advantage in the years to come.

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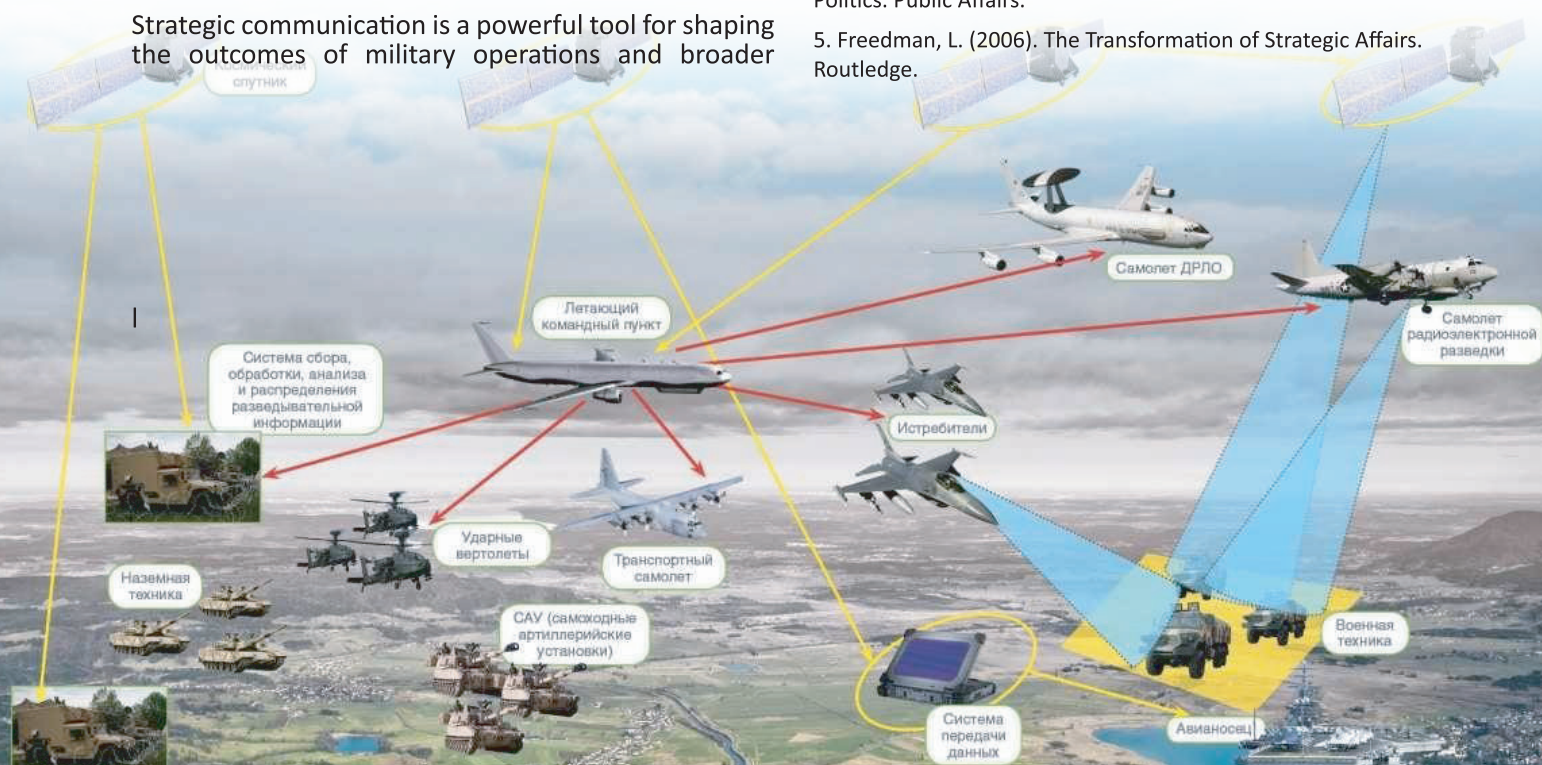
AUKUS: A SECURITY PARTNERSHIP ADDRESSING STRATEGIC LANDSCAPE IN THE SOUTH CHINA SEA
by COL SARAVANASENNAN A/L R.VEERASENNAN RMAF

It is imperative to look at South East Asia for us to postulate the situation of South China Sea where the strategic competition is brewing. South East Asia has expanded rapidly into a new era with a promising and enduring economic growth outlook. According to Economic Outlook, South East Asia has transformed the area into a potential economic theatre that entices global economic superpowers like China and US to construct business model initiatives such as the Trans-Pacific Partnership and Belt and Road Initiatives. The economic tie formed by these large powers instils a feeling of economic competition in the area, causing South East Asia states to be wary. Recently, the economic strategic struggle between China and US was decisively won by China when the US withdrew from the Trans-Pacific Partnership and became unable of advancing their agenda (United States Trade Representative 2017). The inability of the United States to live up to its commitments when it signed the accord in 2016 is a clear indicator that it lacked the economic power of China to pursue such efforts, so undermining regional confidence (Paramita and Kakali 2017).

In the current geopolitical environment, South East Asia is becoming US – China "testing ground." and South China Sea as the "boxing ring". Both big powers are vying for as much strategic influence as possible in order to become the dominating force in the area. Given a consequence, South East Asia nations are unable to decide which side to support, as each nation has distinct national interests and economic outlooks. Adopting a neutral stance between US and China produces unease and conflicts, despite the fact that both options provide economic advantages. Long-term, the game of "choosing sides" would generate unsettling tension among the members.

The South China Sea makes it difficult to find a comprehensive solution to the contentious situation with China. As littoral nations adopts a passive stance and lacks the military capability to oppose China, China is able to assert dominance over South East Asia. In addition, the South China Sea issue remains contentious that requires a balancing act or mechanism to mitigate the strategic competition landscape.

AUKUS

State of war, the normal condition of life in the international system, is most robustly explained and sensible. In the classic 'On War', Carl von Clausewitz further infers that the 'character of war' changes, but the 'nature of warfare is enduring.

"Si vis pacem, para bellum"

- Publius Flavius Vegetius Renatus

The above means, "If you want peace, prepare for the war". The above quote eloquently encapsulates the fundamentality of the matter at hand. AUKUS, since its calling into the global realm, has become a pretty sensational paradox. The host was serious, whereas the receiving end considered the pact a habitual joke. As the deal is still in motion, much of its literature is still in its infancy. However, it is appropriate to address the question with substantial references.

AUKUS is a trilateral security partnership between Australia, UK and US. Its goal is to provide nuclear-powered submarines to Australia for deployment in the Indo-Pacific region where South China Sea lies. The significant deal for Australia to have its nuclear power submarine with better capability, endurance, and within reach to deliver more firepower options to address China's assertiveness in the South China Sea. The AUKUS will supplement past US security partnership and regional strategic partners, such as the Five Eyes and the QUAD, strengthening diplomacy, global governance, health security and intelligence sharing. The media has

primarily misinterpreted the AUKUS agreement as an "alliance", which has filtered down to popular opinions and, unhappily, some security analysts who should be more discriminating. President Joe Biden referred to AUKUS as "a new phase of trilateral security cooperation" in his joint announcement. In contrast, this deal is a new era of Australia's trilateral defence partnership, as stated by the Australian Prime Minister. The Australian Navy is reportedly interested in buying at least eight nuclear-powered submarines. However, it is unknown whether it will seek BAE System Astute-class submarines from the UK or Virginia-class submarines from the US. The project costs an estimated ninety billion Australian Dollars, with the first boat in the water by the end of the decade. In fifty years, the US has been willing to share its submarine technology with Australia. So, Australia will be the seventh country to operate nuclear-powered submarines after the US, the UK, France, China, India, and Russia.

Why nuclear-powered submarines? The acquisition of nuclear-powered submarines will significantly strengthen the Australian Navy. These submarines are renowned for their endurance and have much more advanced capabilities than conventional ones. The agreement shall cover submarine capabilities, quantum technologies, artificial intelligence and cyber capabilities. Even though the declaration included no explicit mention of China, experts believe the agreement was driven in part by Washington, Canberra and London's desire to secure their interests in the Indo-Pacific region in the face of China's growing regional dominance. The joint statement announcing the AUKUS security partnership referred to Australia, the UK, and the US shared concerns about Beijing's military development in the region. The UK observed the Indo-Pacific as a centre of geopolitical security contest and will create a new challenge in the following decades.

AUKUS, on the other hand, is not a mere memorandum of understanding on the exchange of nuclear submarine technology, with Australia obtaining and fielding eight of those 'peak predator' deterrent weapons. AUKUS fundamentally also includes four vital areas for future military force amplifiers, as mentioned above. These AUKUS emphasis areas are crucial for the three states and Indo-Pacific security for the next three to twenty years. Signalling the second significant emerging Indo-Pacific focused multilateral marginalization is another AUKUS's second fictitious aim on the Australia-Japan-US-India Quadrilateral Security Dialogue. The QUAD's objective is primarily about 'public goods' that interconnects the area in promoting transparent and honest values and conduct. It is about hard-edged security cooperation to discourage Beijing's leaders from pursuing their objectives through military force and intimidation. AUKUS is a crucial complement to the QUAD and an essential component of a free, open, and inclusive Indo-Pacific to the extent that it increases the fighting capabilities of Australia, the UK and the US, consequently shifting the Indo-military Pacific's balance away from China.

Nevertheless, Australia pledges its active participation in the present Indo-Pacific region's regional frameworks for diplomacy and security and economy, including APEC. AUKUS, on the other hand, is a statement that, as with the QUAD, Australia and the US perceive a critical need to bolster a balancing policy with actual weight. While conversation and collaboration are necessary, without credible deterrence and a substantial counterbalance, a dialogue will accomplish nothing, and genuine cooperation will be limited. AUKUS never intended to replace the broad and successful Five - Eyes intelligence collaboration between Australia, New Zealand, Canada, the UK and the US. The said
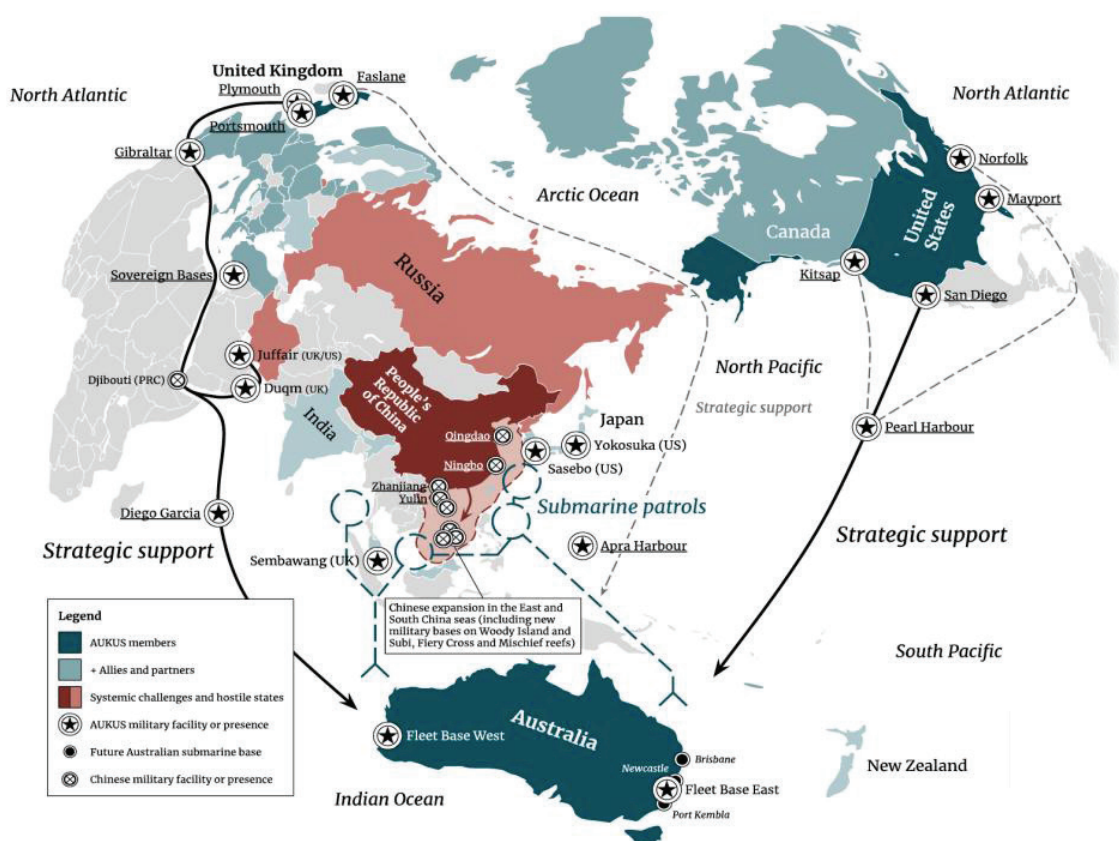
intelligence relationship overlaps significantly with AUKUS's technological priority areas. Advanced intelligence skills must include a working knowledge of artificial intelligence, cyber, and quantum technology. However, since the Five - Eyes relationship in those technical domains is primarily focused on intelligence, and most of the cooperation takes place behind highly confidential limits, techniques within this domain do not naturally leak into the Five Eyes military or national security institutions. In principle, AUKUS members understood this and established AUKUS as a mechanism for their respective forces to advance more quickly without relying on the intelligence community.

The French ambassador said that excluding France regarding our values and respect shows a lack of coherence and regret. A hot angered denouncing as "a stab in the back" of the French Foreign Minister describing that Australia has torn up its submarine deal with them worth more than fifty billion euros. The announcement of AUKUS is a worthy deal that allows his security partnership members to share or transfer their advanced technologies and build in Adelaide with close cooperation of the partnerships. They were reports beginning of this year that Canberra was seeking to walk away, wanted out due to demand and issues, not compliance. Cybersecurity is raising concerns about the security of its Australian project after DCNS has compromised. The budget blowout almost doubled to switch the Barracudas from diesel to nuclear power technology to fifty billion Australian dollars. Timeline plagued the submarine project to extend multiple major contract milestones; thus, the Australian government was a hold-up in signing an agreement over disputes about warranties and technology transfer. Lastly, jobs' deal over local industry involvement with ninety per cent local had revised to sixty per cent and was pushing back lower.

The AUKUS itself will undermine the European Union (EU) and BREXIT Dream. The French perceived breach of trust and were angered by what AUKUS for EU and BREXIT posed as a threat. The AUKUS partnership may view the US siding the UK in the European separation. Thus, the AUKUS deal is any BREXIT dream, to insult a big reveal that ultimately rolled out its new


Indo-Pacific strategy. President Trump called the EU the US's greatest global foe. Indonesia and Malaysia fear the submarine deal will exacerbate regional tensions and an arms race. Moreover, trilateral security partnership will bolster a new game-changing and pivotal conflict. Hence, after the BREXIT, the US still wants the UK, not the EU, engaged as its critical military partner, including the QUAD security partnership members.

Summary

Since Japan's defeat in 1945, the region has witnessed formation of several formal regional security partnerships to address common threats, where some of them were U.S.-led. The critical question is whether this past experience would be a strong indicator for new present security partnership formation requirement after QUAD? Analysing reasons for the failure of past security partnership, we could deduce that the same results will prevail if present security partnership is incorporated without addressing the old issues that still exist today. In the AUKUS domain, the issues of diverse political systems and organizations of regional states despite similar democratic ideology is not present. Similarly, race and religious diversity is also not being debated. Furthermore, trust and sincerity level among them is not questionable looking at their past history and the 'coming together' during difficult times. Moreover, their intention for collaborating in location, issues and degree of seriousness as having the same source of threat, China. The assertiveness and the compulsion for AUKUS was almost immediate. Proponents argued, security partnership is a mere extension of existing defence bilateral, multilateral and partnership between the US and other states. It offers promising starting point to move forward despite current bilateral relations have their own delicate issues, unique to each state, significantly influenced by regime change. For example, the law prohibits permanent foreign military base on Philippines' soil in 1987, leading the departure of U.S. forces, that later return with "rotating temporary base" as stipulated in the 1999 Visiting Forces Agreement and as China threat become eminent, the 2014 Enhanced Defence Cooperation Agreement (EDCA) granted longer stays and use of more facilities.

Nonetheless, the aim of projecting a security partnership is the most credible rationale as the combined strengths with the inclusion of U.S. advance hardware and forces would out-weight those of China, put aside nuclear deterrence element in the equation. However, US led security partnership formation might trigger a security partnership of China security partnership consisting Russia, Pakistan and perhaps Iran, leading to a new cold war, an unfavourable outcome of instability with adverse impacts to economy and trade while heighten security threats.

Moreover, western democracy, freedom of navigation and passage to promote "open and free" region, is a good gesture considering the infringement of FOIP by China militia over disputed territorial water which constantly denied by Chinese government. In addition,
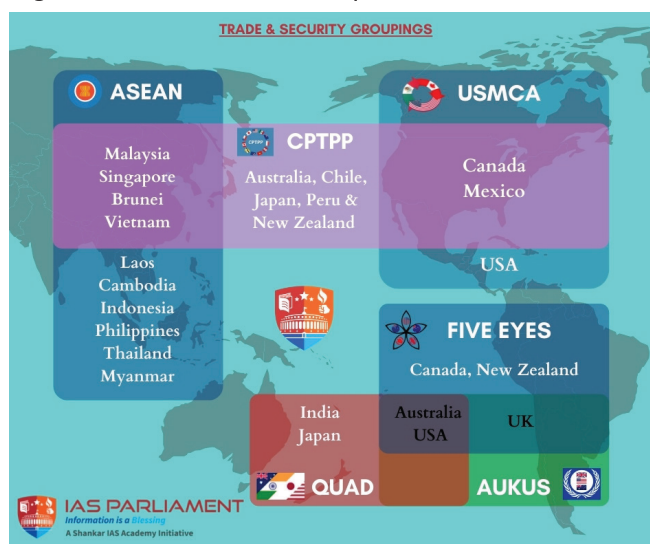
the dynamic of NATO members constantly sending warships to support the US under pretext of protecting their national interest in the region is something serious to consider especially from the standpoint of preserving US hegemony. It signifies western ego after dismay retreat of the US from the Middle East, demonstrating the U.S failure to live up as world hegemony after being beaten by a mere small guerrilla force. This might be a stronger justification for the US to pursue security partnership institutionalization like AUKUS. Opponents argued, the US, currently lack reliability as they are facing internal struggle to revive their stagnant economic and deal with their losses in several oversea conflict intervention. President Trump victory, sent stronger pressure for domestic needs focused rather than interfering with others' problems, who later effected the withdrawal of U.S. from Trans Pacific Partnership agreement, a reversal of a security partnership spirit and setback to US hegemony position thus allowing China the opportunity to shine.

Furthermore, most regional states are economically dependent on China prompted them to avoid making any offending decision, especially to forge a security partnership with US and risk adverse economic repercussion, in worst case, political instability. In addition, the presumption of China aggression is to threaten South China Sea littoral states without valid reason is difficult to prove, despite ancient history illustrated their conquering inclination. In summary, there are strong arguments for and against the institutionalization of security partnership in South China Sea. Proponents believed the need for US to preserve its hegemony and boost up morale as superpower, projecting strong deterrence capabilities in balancing its rival, China, power and fulfils its commitment in providing security and stability to allies and the region. Opponents concerned with such security partnership sustainability considering the diversity of key security partnership factors from real intention, member's obligation fulfilment tendency and individual states political "uniqueness" that in some cases volatile. They argued the threat perceptions itself, whether it is real or merely a propaganda with over exaggerated psychology war to form security partnership and taking advantage of the fear to "rob" the regional states of its resources, including procuring unnecessary weaponry and paying for external forces stay, in the pretext of providing security. However, both sides believed that intervening factor for security partnership realization rests in the hand of US and China to balance their strategic competition in their thirst for hegemonic legacy - thus the urgency and the inevitability formation of AUKUS.

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STRATEGIC LEADERSHIP AND STAFFING EXCELLENCE
by LT COL ABANG RADUAN BIN ABANG MADIHI RMAF

In today's rapidly evolving organizational landscape, the interplay between strategic leadership and staffing excellence has become increasingly critical for achieving persistent success. It serves as a pivotal context for understanding the essential components that drive effective leadership and optimal staffing at the strategic level.

One of the foremost challenges is the **Leadership and Strategic Thinking Applications**, which explores the issue of practicality in implementing and integrating leadership principles and strategic thinking skills. Leaders must possess theoretical knowledge of strategic frameworks and demonstrate the ability to implement these concepts in real-world scenarios.

Credit picture to Rich Horwath, 2021, Strategyskills.com

Additionally, the availability of competent staff at a strategic level is crucial for successfully executing organizational goals. The deficiencies often observed among staff officers and section leaders in meeting strategic staffing requirements can hinder an organization's ability to navigate challenges effectively.

This exploration aims to highlight the importance of integrating robust leadership practices with capable staffing to foster an innovative and resilient organizational culture.

How does one transition from tactical to strategic leadership and staffing at the strategic level? This enduring question is rising again. "Transitioning to a strategic professional is a multifaceted and, in a larger sense, lifelong and continual process and

requires comprehensive capacity development" (Browning, 2013).

Some can make the transition, others cannot. Even among those who make the transition successfully, **capacity varies in character and leadership attributes.** Some strategic professionals are very successful in selected areas but not in others. Furthermore, strategic leadership within a narrow technical or specialty area differs from strategic leadership exercised in a broader scope. Those who try to reduce to a simple formula what it takes to be a strategic leader or to develop someone to become one do not understand the complexity of the phenomena they are dealing with.

Implementing and integrating leadership principles with strategic thinking skills presents a practical challenge that requires a nuanced understanding of organizational dynamics and a commitment to fostering a culture of collaboration and innovation.

This challenge's impact is crucial because it directly influences the organization's ability to navigate complex environments, anticipate changes, and capitalize on opportunities. Leadership and strategic thinking are fundamental to setting a clear direction, inspiring teams, and making informed decisions. "With strategic foresight, organizations can improve with innovation, potential competitiveness, and effective management, impacting the organization's overall performance" (Browning, 2013).

Inadequate leadership capacity and deficient strategic thinking ability will lead to inefficiencies, and a lack of strategic vision may affect "organizational culture, climate, and other staff morale, resulting in decreased performance and individual retention." (Groysberg, 2015) To ensure future viability and success, organizations must prioritize leadership development, foster innovation, and invest in leadership professional education programs that adopt agile methodologies and embrace human resource transformation. There is no fixed equation for strategic thinking ability, and there are no right or wrong answers regarding the applications of strategic thinking in any situation involving those organization's functions.

Leadership and staffing at the strategic level must understand the effects at the operational and tactical levels to serve the bigger context toward the organization and the nation's interest, especially those depicted in the Defend White Paper, 2019.

Strategic thinking applications require knowledge, exposure, and maturity and must start with a collective perspective or understanding of certain matters or issues. In the context of air power organizations, the Royal Malaysian Air Force is developing a strategy to adapt to the National Military Strategy 2022 (NMS 2.0) aspiration. To understand the national defense concept beyond just war and the broader societal and political context within which military decisions are made. This perspective emphasizes the importance of aligning military objectives with national interests and policies.

On that score, strategic military personnel and staff must understand the limits and constraints of the organizations regarding capability development, preparedness, and readiness to suit national capacity in a dynamic environment. For instance, the leader or strategic staff has to understand the finance or budget flow from national to MINDEF, MAF, and RMAF, thus drawing the organization's limits.

The second challenge is that the effectiveness of an organization at the strategic level is often undermined by **deficiencies in the competencies of staff officers and department leaders**, which hinders their ability to meet essential strategic staffing requirements. The personnel assigned to strategic roles at any headquarters level, whether directly or indirectly, play a crucial role in the Royal Malaysian Air Force (RMAF) organization. Some may view themselves as strategists. These strategic staff members are part of the inner circle of RMAF's top leadership and are integral to its core functions. Selecting the right individuals for this department is vital for the overall success of RMAF's vision, mission, values, and strategic objectives.

3 Ways to Improve Strategic Thinking

Credit picture to Ramseysolution.com,
3 ways to improve Strategic Thinking, 2020

The staff must be influential strategic thinkers for "**best military advice** who assess complex situations, anticipate future trends, and formulate effective long-term plans." (Rapp, 2015) While not all, several staff members assigned to strategic roles may lack adequate professional development in strategic

thinking, often transitioning from operational and tactical mindsets.

This gap necessitates comprehensive staff development programs. As a result of these challenges, some personnel may struggle to perform their duties efficiently, and staff may have their own perspective on strategic product priority in the headquarters.

Without comprehensive mitigation, it will impact strategic alignment and resource optimization to maximize organizational function, foster a positive work environment, enhance trust and collaboration between inter- and intra-agencies, and achieve the organization's strategic objectives. To face this challenge, there is no single opinion; it must be discussed with collective output, and staff must be selected based on selective criteria for ideal strategic human resources.

The organization must evolve, readjust, and adapt to ensure its future viability and success in human resources. **Strategic leaders and staff must understand, be trained, nurture, and inspire**. The RMAF must enhance strategic leadership education through formal training or courses for this kind of strategic assignment.

The "**Leadership level of personnel must have the Competencies Standard**." (Doty, 2012) It is essential to define the competency standards required for staff involved in strategic management. For example, insert the Competencies Standard as one module in Professional Military Education according to their rank and service terms. This approach ensures Strategic staff are trained to lead strategically and adapt effectively to organizational needs.

The significant aspects and strategic leadership perspectives will make materializing the needs more practical and feasible. (1) **Assessing and shaping organization culture**. Any leader must be able to identify workplace issues and understand the staff and work processes because "the organization is a hybrid of bureaucracy and networks"(Fussell, 2017).

The preliminary assumption shall delve into the perspective that most people are prepared for their assignment or work scope but not trained or skilled, and the organization needs to adjust for future success, introduce changes, and allow practices. (2) **Advice, dissent, and "the profession of arms**." (Swain, 2017) The "trusted strategic advisor is essential to the organization." (Lukaszewski, 2008) Providing practical education or training through hands-on experience in real-world situations, breaking barriers, and establishing relationships is vital to fostering connections and trust. Inspiring leaders or staff "development with well-trained for specific training or expertise to boost readiness and actual capability." (Swain, 2017) Use discussions to "develop and enhance skills or understanding." (Cartwright, 2015) Dialogue, sharing experiences, and exchanging ideas can facilitate valuable learning. Finally, evaluate the effects of the improvement cycle.

To sum up, the first part of this article addresses the two most significant challenges within the strategic department, which is critical for the RMAF's overall effectiveness at its strategic organization level. By investing in leadership development, strategic thinking applications, and selected strategic staff, the RMAF can enhance its capacities and adaptability in navigating complex environments and fulfilling its strategic goals. These efforts will contribute to a more vital, efficient organization that meets strategic expectations, develops excellent leaders and staff, and contributes effectively to national defense objectives.

In addition, reflecting on experiences and learning and watching other strategic leaders and staff, a few patterns might become a **lesson learned**.

Problems can be classified as routine or adaptive. Routine problems have identifiable, recurring solutions, while adaptive problems are complex and require collaborative understanding. They do not have permanent solutions and need temporary resolutions that evolve.

Strategic leaders should focus primarily on adaptive problems, refining skills in team assembly, fostering respectful discourse, and maintaining a long-term perspective. These skills are essential for effective adaptive leadership, enabling teams to navigate complexities and address challenges as situations change.

Solving adaptive problems differs from routine and emerges through dialogue rather than direction. Strategic leaders engage in this dialogue, recognizing that resolutions are temporary and require periodic review due to changing conditions and unforeseen events. Execution unfolds over time across various leaders and locations. Therefore, it is crucial to cultivate skills for achieving organizational alignment and implementing a management system that enables continuous feedback, learning, and adaptation.

Credit picture to Pretty-Bohemian, 2021, Pinterest, google.com

The **leadership space for strategic leaders extends beyond the hierarchical structure typical of tactical leaders**.

While tactical leaders focus on "two up and two down" (Swain, 2017) within their chain of command, strategic leaders must also navigate non-hierarchical relationships with external individuals and organizations that impact their missions. As strategic leaders advance, their leadership space broadens, necessitating strong communication and persuasive skills, relationship-building, and fostering respectful disagreement to facilitate decision-making and progress.

Decision-making for strategic leaders evolves to focus on decision space instead of fixed points as **conditions develop over time.**
This approach requires anticipatory analysis of when decisions must be made, identifying the minimum necessary information, and determining how to gather and present it. Strategic leaders often delegate decisions to subordinates by clarifying information needs, criteria, and timing. Given the inherent ambiguity in decision-making, it is crucial to implement a management system that supports continuous feedback, learning, and adaptation.

Credit picture to Training Journal, 2018, google.com

Due to their extensive responsibilities, strategic leaders must manage their time effectively. They must **prioritize importance over urgency**, utilizing a formal time-management system that goes beyond a simple daily schedule. This system includes a disciplined meeting rhythm that provides subordinates with necessary guidance and allows time for reflection, which is crucial for effective leadership. Establishing priorities, aligning time allocation with those priorities, synchronizing meeting schedules, and evaluating time use are vital components of this system.

Thinking styles shift from tactical to strategic leadership. Tactical leaders focus on discrete actions within closed systems. In contrast, strategic leaders engage with open systems, adopting a campaign-like mindset where individual decisions contribute to a more significant future whole. They must simultaneously **consider present actions, potential collective reactions**, and their alignment with long-term goals.

As realities change over time, strategic leaders must adapt based on new insights to achieve their broader objectives. This complex process demands multiple feedback mechanisms, an open yet focused mindset, adaptable subordinates, and a flexible organization.

Embarking on the above perspective in the realm, which is still not comprehensive, highlights the intricacies of strategic leadership and the challenges in identifying and nurturing leaders and staff capable of thriving in such roles. A key takeaway from this brief overview is that, although vital, **excelling as a tactical leader does not provide a reliable basis for choosing individuals who might succeed as strategic leaders**.

The distinction between tactical and strategic leadership is fundamentally different, not just a matter of degree. While some skills may overlap, the differences are more pronounced. A trait of a thriving organization is its ability to self-reflect, learn, and adapt. This article contributes meaningfully to the ongoing dialogue at all organizational levels, guiding the transition from tactical to strategic leadership and staffing within the appropriate context in the RMAF to evolve better than yesterday.

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AEROMEDICAL EVACUATION IN ROYAL MALAYSIAN AIR FORCE
by MAJ (DR) TZAI MENG ONN

Introduction

Aeromedical Evacuation (AE) is a critical component of military operations, designed to transport injured or ill personnel from the frontline or remote locations to medical facilities where they can receive necessary care and where the AE process is medically supervised. In the context of the Royal Malaysian Air Force (RMAF), the importance of AE has grown significantly over the years, particularly in responding to diverse operational needs, humanitarian missions, and disaster relief efforts.

This introduction aims to provide an overview of AE's evolution, capabilities, and strategic importance within the RMAF, highlighting its operational frameworks and contributions to national and regional security.

Overview Of AE in RMAF

AE is defined as the transportation of patients by using an aircraft from the point of wounding to medical facilities for advanced treatment. AE can also be done from one medical facility to another for definitive treatments. Aeromedical Evacuation Coordination Centre (AECC), Institute of Aviation Medicine (IAM) Subang Airbase plays an important as a coordination centre to advise RMAF for AE decisions where the final decision of an AE operation will be decided by the Chief of Air Force or the Chief of Air Operation.

General Principles of AE

The AE was conducted in RMAF and equipped with in-flight medical care provided by the flight surgeon and paramedics. More specialised capabilities from the Armed Forces Hospital might be involved during AE for critical care cases. There are several fundamental principles that should be considered when AE is proposed for any patient or casualty:

1.   AE must offer a clear advantage to the patient/ casualty. The advantages of AE have to be weighed against the benefits of maintaining the medical care on the ground and potential complications of AE.

2.   AE is not a therapeutic intervention. However, it does have side effect and complications. Therefore, AE requires careful planning and risk assessment to ensure the potential problem is anticipated and provided for; all aspects of the patient's journey and potential care requirements throughout need consideration and mitigation.

3.   Patient / casualty must be reassessed regularly throughout the AE process.

4.   Since there is no dedicated air ambulance within the RMAF, the AE will be done on an opportunistic basis.

Key Aspects of AE in RMAF

1.   **Aircraft Utilisation and Configuration**: The RMAF utilises various aircraft for AE missions, which include the Lockheed C-130 Hercules and the Airbus A400M Atlas. These aircrafts can specifically be configured to accommodate stretchers, medical crew, and essential medical equipment to facilitate the safe transport of patients. In a smaller scale of patients / casualties AE missions, EC 725 AP is indeed a better option to execute the missions. The incorporation of advanced medical technologies on board improves patient monitoring and stabilisation during flight.

2.   **Training and Medical Personnel**: The effectiveness of AE missions relies heavily on the proficiency of medical personnel in cooperating with the aircrews. The RMAF emphasises extensive training programs for its AE teams, which include flight surgeons, nurses, and paramedics. These personnel are trained in clinical skills, emergency procedures, and multitasking in high-pressure scenarios. Regular drills and collaborative exercises with allied forces further enhance interoperability and operational readiness.

3.   **Operational Readiness and Response Strategies**: The RMAF operates a robust command and control structure for AE operations, ensuring rapid crisis response times. This encompasses coordination with ground forces, civil aviation authorities, and

medical facilities ahead of a mission. The agility in planning and execution of AE is critical during natural disasters, conflict zones, or humanitarian missions, demonstrating the RMAF's capability to respond swiftly and effectively.

4. **Humanitarian and Disaster Response Missions**: In addition to military operations, the RMAF has been engaged in numerous humanitarian missions where AE played a vital role. During natural disasters like floods and earthquakes, the RMAF has provided AE to rescue victims from remote areas. The flexibility and versatility of AE capabilities underscore Malaysia's commitment to supporting not only national interests but also regional stability and humanitarian efforts. In this matter, we can clearly see during the recent AE missions of Palestinians from Egypt.

5. **Integration with Regional and International Partners:** The RMAF collaborates with various international partners to improve its AE capabilities. Joint exercises and training initiatives with countries such as the United States, Australia, and other ASEAN nations enhance interoperability and share best practices. These collaborations not only bolster the RMAF's operational readiness but also solidify regional relationships in addressing common challenges.

AE Classification

AE can be classified into 3 main forms based on NATO Standards:

1. **Forward AE** – Medically escorted movement of patients/casualties from the point of injury (such as the battlefield) to a first medical treatment facility. It requires speed and flexibility, and it is, therefore, usual to be carried out on rotary wing assets. For example, No.5 and No.10 Squadron RMAF equipped with EC 725 AP are usually the main components in carrying out this form of AE since both of these squadrons are capable of providing Combat Search and Rescue (CSAR).

2. **Tactical AE** – Medically escorted movement of patients/casualties from one medical treatment facility to another for a higher level of care or surgery. Both fixed-wing and rotary-wing assets can be utilised in this form of AE.

3. **Strategic AE** – Medically escorted movement of patients/casualties away from the theatre of operation or to a designated location for definitive care. Due to the distance involved, fixed-wing assets are typically used. For instance, Lockheed C-130 Hercules and Airbus A400M Atlas are the options to evacuate or transfer a patient/casualty from East Malaysia to West Malaysia (Level 4 Hospital mainly located in West Malaysia).

Aircraft Consideration

Rotary-wing aircraft and fixed-wing aircraft from the RMAF can be utilised for AE on an opportunistic basis. There are many factors that determine the type of aircraft used for any particular AE.

Rotary Wing Aircraft: Used for rapid evacuation from the battlefield or other inaccessible areas.

Fixed Wing Aircraft: Utilized for transporting larger number of patients/casualties over long distances, equipped with advanced medical care equipment and facilities.

General Medical Consideration - Stressors of Flight

It is a completely different environment that patients/casualties encounter during the flight journey compared to on the ground. There are a few stressor factors that should be considered before carried out the AE mission.

    G - G-Force
    H - Decreased Humidity
    O - Decreased Partial Pressure of Oxygen
    S - Shakes / Vibration
    T - Thermal Changes
    B - Barometric Pressure Changes
    A - Air Sickness / Anxiety
    N - Noise

Bunga Mas Lima AE Mission

On 12 Sep 2022, No. 5 Squadron Labuan Airbase received a tasking for AE mission to be executed immediately at Exercise Area. The incident happened at a Royal Malaysian Navy (RMN) Auxiliary Ship, Bunga Mas Lima. Initial transmission noted there was a RMN personnel fall from 10 meters height onto the deck of the ship.

A medical team from 818 Rumah Sakit Angkatan Tentera Labuan Airbase was called upon together with the aircrews from No. 5 Squadron to discuss the mission execution further. The AE team comprises aircrews, medical officer, nurse and special force personnel (CAR Team).

The flight took off right after receiving the NOTAM. Upon visualisation of Bunga Mas Lima, the helipad was occupied and not able to perform on-deck landing. The medical officer was requested to put on NATO Strop and perform winching together with CAR Team personnel to get on the deck to review the casualty.

Picture 1. The Medical Officer and CAR Team winched down to access the casualty on the deck in view of aircraft unable to perform deck landing

Upon attending the casualty, he appeared to be confused, agitated and disorientated. During the trauma primary survey, the casualty was noted as having a significant swelling over the back of his head. Otherwise, no other injuries were seen. Based on the condition, the casualty was suspected of Cerebral Concussion and might have bleeding in the brain. The casualty was given appropriate first aid and subsequently transferred on a TRANSACO stretcher.

Picture 2. Casualty safely secured on TRANSACO stretcher

After the casualty was secured onto the stretcher, he was winched up from the deck to the aircraft and proceeded to transfer.

Picture 3. Casualty maintained at 45-degree winch position midair to ensure safety and comfortability

Picture 4. Casualty close monitoring

The casualty was given medication and monitored closely throughout the flight journey to Sepanggar Naval Base in Kota Kinabalu. Medical officer onboard communicated with the aircrews to fly at the optimum flight level and at a constant speed in order to provide a comfortable environment for the casualty throughout the flight journey.

pon arrival at Sepanggar Naval Base, the casualty was transferred to an ambulance, and the case was passed over to the medical officer from Wilayah Kota Kinabalu Armed Forces Hospital. The AE mission was successful, and the casualty was transferred safely. The casualty was then transferred to Queen Elizabeth Hospital for further treatment and assessment.

Picture 5. Casualty handing over to Wilayah Kota Kinabalu Armed Forces Hospital Medical Officer

Based on this, AE mission needed the good cooperation and skilful manoeuvre from the aircrews, medical staffs and special forces personnel to execute a safe mission for the casualty.

In a nutshell, Aeromedical Evacuation is a vital operational capability for the Royal Malaysian Air Force, enhancing its effectiveness in various military and humanitarian missions. The evolution of AE within the RMAF reflects its commitment to adopting advanced technologies, training its personnel effectively, and maintaining readiness for rapid response in times of need.

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THE ROYAL MALAYSIAN ARMED FORCES STRUCTURE OF OPERATIONS AND READINESS IN THE ARMED FORCES
by MAJ KHAIRULLIZAM BIN SAHARUDDIN RMAF

In addition to safeguarding Malaysia's national interests and sovereignty, the Royal Malaysian Armed Forces (RMAF) are tasked with the responsibility of preserving Malaysia's territorial integrity. As a multifaceted organization, the Royal Malaysian Air Force (RMAF) is tasked with the responsibility of assisting in the management of internal crises, humanitarian missions, and disaster response situations, in addition to safeguarding the nation from external dangers.

When seen from this perspective, operations and preparation are of the utmost importance since they are fundamental components of the RMAF's makeup and functioning. Throughout this article, the complexity of operations and preparation within the Royal Malaysian Air Force (RMAF) are dissected, along with the ways in which these components contribute to the effective execution of military missions and to the overall security of the nation.

Perspective on the Operations of the RMAF

From the time it was established in 1958, the Royal Malaysian Armed Forces (RMAF) has grown from a very modest force into a highly structured military organization. In the early years, the Malayan Emergency, which obliged the military to carry out counter-insurgency operations, was the defining characteristic. The lessons that were learned during this time period served to enhance the RMAF by putting an emphasis on the need of flexibility, collaboration, and the requirement for perpetual preparedness.

Additional regional crises, such as the conflict with Indonesia in the 1960s, brought to light the imperative of maintaining operational preparedness. This was a further demonstration of the importance of doing so.

As a result of altering defense strategy, increasing military technology, and shifting geopolitical realities, the Royal Malaysian Air Force (RMAF) has undergone considerable transformations over the course of its history. Today, the Royal Malaysian Army, the Royal Malaysian Navy, and the Royal Malaysian Air Force are the three branches that make up the Royal Malaysian Armed Forces (RMAF).

There is a plan in place for each branch to function within its own specialized domain while simultaneously being incorporated into joint operations with the purpose of providing comprehensive national security.

Composition of the RMAF and Its Organizational Structure

For the purpose of ensuring preparedness and enhancing operational effectiveness, the organizational structure of the RMAF has been meticulously structured. The highest level of this hierarchy is occupied by the Ministry of Defense, which is responsible for formulating defense strategy and overseeing military activities. The Chief of Defence Forces (CDF) is in charge of the Royal Malaysian Air Force (RMAF). This individual is responsible for ensuring that the activities of the three branches are coordinated and that they are in accordance with the plans for national defense.

Within each branch, operational units, which include combat, support, and logistical components, are organized into a variety of formations and subunits; these vary depending on the branch. An illustration of this would be the fact that the infantry, armor, artillery, and air defense divisions of the Army all collaborate in order to support ground operations. In the same way as the Air Force is structured with fighter squadrons, transport wings, and training units to support aerial operations, the Navy is structured with fleets, squadrons, and operational groups to ensure that maritime control is maintained.

Additionally, the hierarchical structure of the organization encourages effective command and control, which in turn enables quick decision-making and agility during operations. This organization is essential for ensuring that preparedness is maintained since it enables the Royal Malaysian Air Force (RMAF) to rapidly mobilize resources, men, and capabilities in response to any crisis or potentially dangerous situation.

Readiness: A Primary Source of Concern

Without a question, readiness is one of the most important components of the RMAF's operational capacity. It takes into account a wide range of aspects, such as the training of personnel, the maintenance of equipment, the planning of strategic actions, and the provision of logistical support. In order to guarantee that the armed forces are able to respond in a timely and efficient manner to unanticipated circumstances, whether they are caused by military threats or humanitarian needs, it is essential to maintain an effective readiness posture.

Instruction of Staff Members

When it comes to military readiness, the training and preparation of soldiers is the most critically important factor. A significant amount of resources are allocated by the Royal Military Air Force (RMAF) to training programs that are meant to guarantee that service members are proficient in their particular jobs. This involves training on an individual basis, training with other people, and working together with ally troops to conduct missions.

Regular participation in joint exercises leads to increased interoperability and strengthens collaboration with other nations, particularly within the context of regional security organizations such as the Association of Southeast Asian Nations (ASEAN) and multiple multinational forces.

Additionally, training encompasses specialized duties, which may include unit-specific drills and simulations that simulate situations that may occur in the real world. Through training of this kind, the Royal Malaysian Air Force is able to carry out operations in a variety of environments, therefore guaranteeing that its personnel are prepared with the abilities essential to carry out their tasks in an efficient manner. Additionally, the emphasis placed on continual professional development helps to boost morale and general competence within the armed forces, which is an important contribution.

Maintenance and Equipment Inspecting

The condition of the military's equipment is also rather significant in terms of preparedness. The capabilities of the Royal Malaysian Armed Forces (RMAF) in terms of operations are supported by a wide variety of contemporary weapons and technology, ranging from simple firearms to intricate air defense systems and naval warships. When it comes to ensuring the operational capabilities of equipment and reducing the likelihood of a malfunction occurring during key missions, it is essential to have maintenance and upgrade plans that are effective.

The procurement processes are carefully regulated in order to maintain a balance between the acquisition of cutting-edge technology and the guarantees that the systems that are already in place are optimized for efficiency. Moreover, the Royal Malaysian Air Force (RMAF) conducts frequent evaluations of its equipment in order to ensure that it is in line with the ever-evolving operational requirements and new threats. It is the robust approach to equipment readiness that boosts the capability of the Royal Malaysian Air Force (RMAF) to conduct a wide variety of duties, including combat operations, peacekeeping, and disaster relief.

Operations: The Process of Putting Readiness Into Action

To a large extent, the preparedness of both persons and equipment is essential to the successful execution of activities. The operational theory of the Royal Ministry of Air Force (RMAF) is founded on the concepts of efficient planning, execution, and evaluation. Operations are broken down into a number of distinct phases, which include pre-deployment planning, the execution of missions, and post-operation reviews.
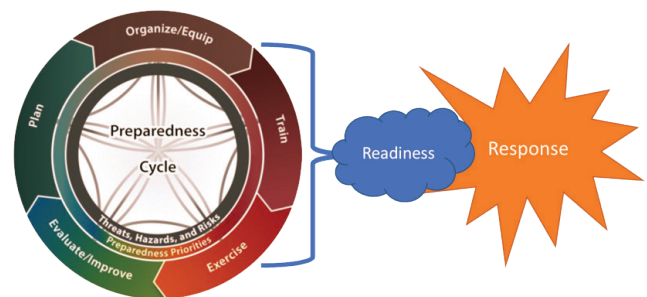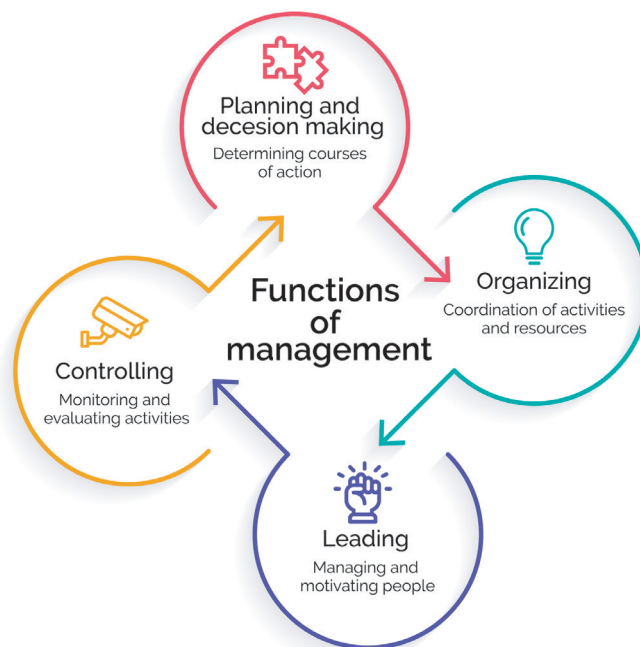

Planning and Coordination of Activities

Careful preparation and coordination are the foundations upon which successful military operations are built. Numerous significant strategic planning procedures are carried out by the Royal Malaysian Air Force (RMAF), frequently in conjunction with civilian agencies and foreign partners. This method, which incorporates a number of different aspects, guarantees that all possible eventualities, such as threats to national security, internal emergencies, and international peacekeeping commitments, are taken into consideration.

Comprehensive evaluations of the geopolitical situation, prospective enemies, and available resources serve as the basis for operational planning within the Regional Military Assistance Force (RMAF). Plans of operations that are extremely detailed contain contingencies for acquiring intelligence, logistics, deploying troops, and communicating with stakeholders.

Coordination is further improved by the focus placed on joint operations across the Army, Navy, and Air Force. This makes it possible to effectively deploy combined capabilities in response to any circumstance that may arise.

Carrying Out Missions

In order for the RMAF to work properly, the execution of operations is the most important component. The Royal Malaysian Armed Forces (RMAF) is required to

Functions of management

Planning and decesion making — Determining courses of action

Organizing — Coordination of activities and resources

Controlling — Monitoring and evaluating activities

Leading — Managing and motivating people

maintain a high degree of operational effectiveness regardless of whether it is engaged in conventional military operations, humanitarian aid, or disaster relief. One of the most important characteristics of successful mission results is the ability to integrate the various components of the armed forces in a seamless manner.

The use of real-time command and control systems makes it easier for commanders to communicate effectively during operations, which in turn enables them to make choices that are informed and based on situational awareness. Drones and satellite systems are examples of modern technology that provide essential intelligence assistance, which in turn improves operational performance in a variety of different scenarios.

Furthermore, the Royal Malaysian Air Force (RMAF) is actively engaged in the process of resolving non-traditional security challenges, such as piracy, environmental catastrophes, and terroristic acts.

Malaysia's position as a proactive actor in regional security is bolstered by the capacity of the Royal Malaysian Armed Forces (RMAF) to perform several roles, which ensures that it continues to be responsive to a wide variety of situations.

Evaluation Conducted After the Operation

Post-operation review is an essential component of the RMAF's commitment to the ongoing development of its operations. Immediately following the completion of each operation, extensive evaluations are carried out in order to identify areas of improvement and lessons learned. The discovery of best practices and the cultivation of a culture of responsibility within the ranks are both facilitated by these assessments.

Additionally, ensuring that insights are disseminated across the business is accomplished by incorporating input from workers who are active in operations. The purpose of this iterative approach is to improve future operational planning and execution, which in turn contributes to the creation of strategies that are able to adapt to changing protection environments.

Concluding Remarks Regarding the Importance of Readiness and Operations during the RMAF

A strong organization that places a priority on operations and preparedness as vital components of national security is shown by the Royal Malaysian Armed Forces (RMAF). With a complete strategy that includes personnel training, efficient equipment maintenance, strategic planning, and the execution of missions, the Royal Malaysian Air Force (RMAF) is ready to respond to a wide variety of problems, ranging from military threats to humanitarian emergencies.

The dedication of the Royal Malaysian Air Force (RMAF) to improving operational effectiveness and sustaining preparedness is still extremely important, despite the ongoing changes in geopolitical circumstances. It is because of this dual emphasis that the Malaysian Armed Forces (RMAF) is able to not only safeguard the sovereignty of Malaysia but also establish itself as a dependable partner in the efforts to maintain regional and global security.

At the end of the day, the activities and preparedness of the Royal Malaysian Air Force (RMAF) represent Malaysia's unwavering will to maintain peace, stability, and security in a world that is becoming increasingly complicated.

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TACTICAL INTELLIGENCE IN RMAF OPERATIONS
by CAPT MOHD KAMARUL AMRI BIN MOHD ZUKI RMAF

Introduction

Tactical intelligence in RMAF operations refers to timely and relevant information that supports immediate decision-making and mission execution. It focuses on providing actionable insights related to specific objectives, targets, and the operational environment during an operation. Tactical Intelligence is critical in determining the success of air operations. It can also help determine strategic planning and execution of attacks, protect assets, and adapt to dynamic battlefield conditions.

Role of Intelligence In Air Warfare Planning

Intelligence is an important part of war or mission planning. It is also the basis for making strategic and tactical decisions. Accurate intelligence data will allow the commander to understand the enemy's capabilities and weaknesses. The intelligence process includes planning, collection, processing, analysis, and dissemination.

Each phase must be carefully executed to produce actionable intelligence that supports the air war objective. Practical intelligence in air war planning requires a holistic approach, combining information from multiple sources.

These include signals intelligence (SIGINT), imagery intelligence (IMINT), human intelligence (HUMINT), and open-source intelligence (OSINT). By combining these resources, analysts can develop a comprehensive picture of the operational environment, identifying potential threats and opportunities.

Furthermore, intelligence supports risk assessment, allowing commanders to anticipate potential challenges and develop mitigation strategies. This proactive approach minimizes potential losses and maximizes the probability of mission success. Additionally, intelligence facilitates the development of realistic and achievable objectives.

By understanding the enemy's strengths and weaknesses, air planners can adapt air operations to exploit weaknesses and neutralize threats. This targeted approach optimizes the use of resources, reducing the need for large-scale and haphazard operations. In short, intelligence is the compass that guides air warfare planning, ensuring operations are strategically sound, tactically effective, and resource-efficient.

Collection Methods for Tactical Air Intelligence

Tactical air intelligence relies on diverse collection methods to gather information for effective air operations. These methods can be broadly categorized into technical and human sources. Technical sources include airborne surveillance platforms with advanced sensors like radar, electro-optical, and infrared systems. These platforms can collect imagery, signals, and other data types over large areas, providing real-time situational awareness.

Unmanned Aerial Vehicles (UAVs) are increasingly used for tactical intelligence collection, offering persistent surveillance capabilities with reduced risk to personnel. Signals Intelligence (SIGINT) involves intercepting and analyzing enemy communications, radar signals, and other electronic emissions. This can provide valuable insights into enemy intentions, force deployments, and command-and-control structures.

Electronic warfare capabilities are also used to disrupt enemy communications and sensors, further enhancing the effectiveness of air operations.
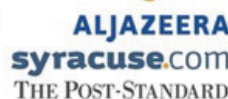
Human Intelligence (HUMINT) involves gathering information from human sources, such as informants, reconnaissance teams, and liaison personnel. HUMINT can provide unique insights that are not available from technical sources, such as enemy morale, local conditions, and insider perspectives.

Open-source Intelligence (OSINT) involves collecting and analyzing publicly available information, such as news reports, social media, and commercial imagery. OSINT can provide valuable context and background information, complementing the data collected from other sources.

Practical, tactical air intelligence requires combining these collection methods to provide a comprehensive and timely picture of the operational environment. Integrating multiple sources also enhances the reliability and accuracy of the intelligence, reducing the risk of deception or misinformation.

Analyzing and Disseminating Air Intelligence Data

The analysis and dissemination of air intelligence data are critical steps in transforming raw information into actionable intelligence. Analysis involves processing, evaluating, and interpreting the collected data to identify patterns, trends, and anomalies. This requires skilled analysts with expertise in various disciplines, such as imagery analysis, signals analysis, and threat assessment.

Advanced analytical tools and techniques, such as data mining, artificial intelligence, and machine learning, are increasingly used to process large volumes of data and identify relevant information. Practical analysis requires a collaborative approach, integrating insights from different intelligence disciplines and operational specialties.

This ensures the intelligence is comprehensive, accurate, and relevant to the warfighter's needs. The dissemination of air intelligence data must be timely, secure, and tailored to the specific needs of the recipients.

This involves using various communication channels, such as secure networks and intelligence summaries, to deliver the information to the right people at the right time. Furthermore, feedback from operational and tactical users is essential to ensure that the intelligence is accurate and useful.

This feedback allows analysts to refine their analytical methods and improve the quality of the intelligence products. Effective dissemination also involves protecting sensitiveinformation and maintaining the integrity of the intelligence data. This requires strict adherence to security protocols, encryption, and other security measures to prevent unauthorized access or disclosure.

Integrating Intelligence with Air Operations

Seamless integration of intelligence with air operations is essential for achieving mission success and minimizing risks. This integration involves embedding intelligence personnel within operational units, providing direct access to intelligence data and analytical support. Intelligence personnel participate in mission planning, target selection, and battle damage assessment, ensuring that intelligence considerations are fully integrated into the operational decision-making.

This close collaboration enhances situational awareness, improves targeting accuracy, and reduces the risk of collateral damage. Effective integration

requires a Common Operating Picture (COP) that provides all participants with a shared understanding of the operational environment.

The COP integrates intelligence data, operational plans, and real-time situational updates into a user-friendly interface. This enables commanders to make informed decisions quickly and effectively, adapting to changing circumstances on the battlefield.

Furthermore, intelligence supports dynamic retargeting, allowing aircrews to engage emerging threats or exploit unexpected opportunities during a mission. This requires real-time intelligence updates and the ability to disseminate targeting information to the aircrews rapidly.

Moreover, intelligence supports force protection, providing early warning of potential threats to air bases and personnel. This includes detecting and neutralizing enemy air defenses, identifying potential sabotage or terrorist activities, and providing security assessments for deployed locations. Integrating intelligence with air.

Challenges and Future Trends in Air Intelligence

Air Intelligence faces numerous challenges in the modern operational environment. The proliferation of advanced technologies, such as stealth aircraft, cyber warfare capabilities, and anti-satellite weapons, poses significant threats to air superiority and intelligence collection.

Data's increasing volume and complexity require advanced analytical tools and techniques to process and interpret the information effectively. The need for timely and accurate intelligence in a dynamic and unpredictable environment places immense pressure on intelligence personnel and resources.

Future trends in air intelligence include the increasing use of artificial intelligence and machine learning to automate analytical processes and improve the speed and accuracy of intelligence assessments.

Developing advanced sensors and surveillance platforms will enhance intelligence collection capabilities, providing more comprehensive and real-time situational awareness.

Integrating cyber intelligence and electronic warfare capabilities will become increasingly important in countering enemy threats and protecting assets. Furthermore, open-source intelligence will continue to grow, providing valuable context and background information.

Moreover, developing more effective methods for sharing intelligence data across different organizations and agencies will improve situational awareness and enhance collaboration. This requires overcoming technical and bureaucratic barriers and establishing common intelligence-sharing standards and protocols.

Addressing these challenges and embracing these future trends will ensure that air intelligence remains relevant, timely, and effective in supporting RMAF operations.

Conclusion: Optimizing RMAF Operations with Tactical Intelligence

Tactical intelligence is a critical enabler for optimizing RMAF operations, providing commanders with the knowledge to make decisions and achieve mission success. Practical intelligence supports strategic planning, enhances situational awareness, improves targeting accuracy, and reduces the risk of collateral damage.

The integration of multiple intelligence sources, the use of advanced analytical tools and techniques, and the seamless integration of intelligence with operational units are essential for maximizing the value of air intelligence. Addressing the challenges and embracing the future trends in air intelligence will be crucial for maintaining air superiority and countering emerging threats. This requires investing in advanced technologies, developing skilled intelligence personnel, and fostering a culture of innovation and collaboration. RMAF can remain dominant in the modern operational environment by prioritizing tactical intelligence and continuously improving its capabilities.

Optimizing RMAF operations with tactical intelligence is a continuous process requiring sustained commitment, investment, and leadership. In conclusion, tactical intelligence is not merely a support function but an integral component of RMAF operations, essential for achieving strategic objectives and protecting national interests. By leveraging the power of intelligence, RMAF can maintain its competitive edge and effectively address the challenges.

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DEFENCE DECISION MAKING IN RMAF
by LT COL SITI SOLEHAH BINTI ABDULLAH RMAF

Introduction

Contemporary security threats required more than just military solutions; they required a coordinate whole-of-government (WOG) response. Defence organisation should continuously adapt to address ever-evolving threats while demonstrating effectiveness of operations, legitimacy based on rules and orders, integrity of decisions and actions as well as inclusiveness. The Royal Malaysian Air Force (RMAF), as a critical component of national defence, is responsible for safeguarding Malaysia's airspace sovereignty. Nonetheless, national security cannot be maintained solely by military organisations. Effective coordination with other government ministries and non-governmental organisations within the defence industry is essential.

For instance, RMAF must ensure interoperability with sister services within the Malaysian Armed Forces, as well as with other government agencies such as Malaysian Maritime Enforcement Agency (MMEA) and the Fire and Rescue Department of Malaysia (BOMBA). Additionally, collaboration with *Majlis Keselamatan Negara* (MKN) and other ministries, alongside operational utilisation of the defence industry such as Government Operate Company Own and Manage (GOCOM) assets and asset leasing – is imperative. Given the increasing complexity of modern security challenges, RMAF commanders must be well-equipped with the necessary skills and knowledge on how to collaborate with non-military organisation during crisis and disaster relief coordination.

This article discusses the tools that were taught in Institute for Security Governance (ISG), Monterey, USA during the Executive Program in Defense Decision-Making. These essential skills set are required by RMAF commanders at various levels of command to enhance defence decision-making and facilitate successful WOG coordination and response. These skills comprise of leadership, management and team-building, the capability to identify biases in decision-making, utilising systems thinking and informed decision-making, as well as skills for interest-based negotiation.

Leadership, Management and Team-Building

Leadership is the ability of an individual to influence, motivate and enable others to contribute to the organisation's success, whereas, management involves the control of a group in order to achieve specified objectives. Military leadership is generally getting people do what they would normally be afraid to do. RMAF Commanders lead and manage in ensuring safe, efficient operations within the military aspects of functions and must be capable to manage their men to accomplish mission while fostering a cohesive and motivated workforce. Team building is a fundamental aspect of military leadership, enhancing espirit-de-corp and fostering collaboration.


Picture 1: Leadership and Management

While the terms "team building" and "teamwork" are often used interchangeably, they represent distinct concepts. Team building focuses on the formation of functional groups, whereas teamwork pertains to the efficient operation of these groups, Both vital for mission success. Characteristics of an effective team include the following:

1. A clearly defined goal and results-driven structure.

2. Competent team members with a unified commitment.

3. A collaborative and inclusive work environment.

4. High operational standards understood by all members.

5. Receive external support and encouragement from higher command structures.

6. Principled leadership that fosters integrity and trust.

Biases in Decision-Making

Decision-making is often influenced by cognitive biases, which can impair judgment and lead to suboptimal outcomes. Understanding these biases is crucial for commanders to ensure rational and objective decision-making.
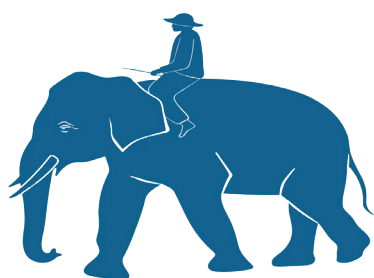
Picture 2: Automatic Elephant (System 1) and The Controlled Rider (System 2)

The dual-system theory of thinking categorises cognitive processes into two systems: System 1 (Automatic Elephant) and System 2 (Controlled Rider). System 1 is fast, intuitive, and effortless, often guiding routine actions and habitual decision-making. Conversely, System 2 is deliberate, reflective, effortful, facilitating analytical thinking and problem-solving. The common thinking patterns of System 1 are referred as cognitive limitations or biases which are tendencies because it often serves a useful function as it is quick efficient thinking, saves energy and time. However, biases may interfere with clear thinking without awareness specially in complex environments. Several common cognitive biases that affect decision-making include:

1. **Framing Bias**. Perception and judgement are influenced by how information is presented rather than by the intrinsic value of the information itself. Perception is easier to distract if external influences were unaware.

2. **Authority Bias**. Tendency to favour and trust an authority figure's input over others, despite better information and opinions by others.

3. **Halo Effect**. This happens when overall impression of a person influence how we feel and think about his or her character. A shabby-dressed person may be seen as incompetent compared to a neat and tidy-looking person.

4. **Confirmation Bias**. This is the tendency to selectively look for evidence or favouring information that affirms to pre-existing beliefs. Evidence that counter "what we already know" will be discounted or ignored.

5. **Groupthink or Social Conformity**. This is when decisions conform to widely accepted view in order to fit in and minimize conflict. Humans are inherently social and are often affected by what others are thinking, doing and their expectations. This may result in a certain frames or patterns of collective behaviour.

In a decision-making process, it is imperative for commanders to recognize and mitigate biases for fair and reasonable decision. To recognize biases, commanders should analyse past performance and reflect previous decisions to identify trends for recurring biases. Besides that, commanders should seek feedback and alternative perspective on decision-making abilities. Additionally, commanders are to evaluate decision-making of others, recognize their biases to gain insight and it will be easier to recognize own biases before allowing the biases affect the decision process.

Finally, allow sufficient time for critical thinking to ensure the System 2 processes are engaged. There are higher chances of inability to recognize own biases when rushing to make decisions. By acknowledging biases and recognising it, commanders are more adept in decision-making.

Systems Thinking And Informed Decision-Making

In order to counter biases in decision-making and develop a comprehensive understanding of complex security challenges, commanders must employ systems thinking and informed decision-making. Systems thinking, as defined by Peter Senge, is a discipline that emphasizes the interrelationships and patterns within complex systems rather than viewing problems in isolation. This approach is essential in addressing security threats that require multi-agency coordination. Systems thinking is a structured way of thinking which helps leaders to step back and question the assumptions. It assists commanders to see underneath the situation, create shared

understanding, identify leverage points to intervene and revise changes in an arrangement. The CYNEFIN framework provides structured approach to decision-making based on four (4) types of situations and nature of problems as follows:

1. **Simple**. Characterised by small number of linearly connected parts. Cause-effect relationships are clear and problems within can be solve without extensive expertise. In the decision-making process, utilise the best practices, rules or standard operating procedures (SOP). Leaders could delegate or automate and pre-determined solutions work.

2. **Complicated**. Involving multiple linearly connected parts. Cause-effect relationships are clear but usually required expertise assistance. To make a decision in this situation, leaders may consult experts who have dealt with the problem before and experts could provide different alternatives to choose. Pre-determined solutions usually work.

3. **Complex**. Featuring large number of interconnected non-linear parts. Multiple causes and consequences that mutually influence each other and cannot fix one part in isolation. It is dynamic, fluid, constantly evolving situation which make it hard to accurately predict. It is difficult to completely solve the problem, but can be steered in desired direction for better solutions.

In decision-making of this nature, have a high situational awareness, understand it as best as you can and focus on relationship/connections for leverage points. Increase interactions and communication to create platforms in order to generate many ideas. Keep adjusting and breaking solutions based on feed-back one step at a time as situation evolves using lessons. Scale what works and avoid what does not work.

4. **Chaotic**. Marked by high turbulence and unpredictability. Initially, it will be hard to distinguish clear cause-effect relationship. Agents are unconstrained and independent of each other. There is no time for deliberation, necessitating immediate action to stabilize the situation and prevent damage from spreading. Leaders are encouraged to use this opportunity to innovate once the situation is stable.

WOG engagement, notably in a crisis coordination typically fall into the complex type situation. Effective commanders must understand the system before intervening by identifying its key elements and their inter-relationship.

Recognise evolving patterns, dynamics and be mindful of biases that can distort seeing the clear picture. Furthermore, the following analytical tools can be applied:

1. **PMESII-PT**. Identifying the threats and opportunities based on Political, Military/Police, Economic, Social, Information, Infrastructure, Physical environment and Time which abbreviated as PMESII-PT.

2. **Problem Tree Analysis**. Identifying the Key Problem (Core), the Roots and Consequences of the problem, the Connection between roots and consequences.

3. **TOWS Analysis**. This is an extension of SWOT analysis framework that identifies Strength, Weakness, Opportunities and Threats but then goes further in looking to match up the internal and external factors. The main purpose of a TOWS Analysis is to reduce threats, take advantage of opportunities, exploit strengths and reduce weakness. TOWS Analysis matrix is as follows:

TOWS MATRIX		EXTERNAL FACTORS	
		OPPORTUNITIES	THREATS
INTERNAL FACTORS	STRENGTH	**STRENGTH-OPPORTUNITIES** **S-O** focuses around how you can exploit your strengths in order to respond to potential opportunities.	**STRENGTH-THREATS** **S-T** examines how strengths can be used to mitigate or remove threats, and in some cases look at how threats can be transformed to opportunities.
	WEAKNESS	**WEAKNESS-OPPORTUNITIES** **W-O** can be the hardest consideration, as it does not always come naturally. Consider how opportunities can remove your weaknesses.	**WEAKNESS-THREATS** **W-T** highlights how weaknesses can play into, develop or enhance threats.

TOWS Analysis Matrix

Negotiation Skills – Interest Based Negotiations

In dealing with other agencies for WOG response, negotiations may be inevitable. There are two negotiation approaches namely competitive (distributive) and interest-based (integrative) negotiation. Competitive negotiation relies on positional bargaining where parties stake out a position and engage in a contest of wills or ego. This approach pursues a single solution to the problem and develop single "bottom line" as part of the single solution sought. In contrast, interest-based negotiations are more principled.

It may be hard on problem but soft on people, where mutual interests that compel various positions are identified. Multiple options are brainstormed to find the best solutions. Best Alternative to a Negotiated Agreement (BATNA) is developed and the negotiations rely on objective criteria for fair standards. Commanders may implement six negotiation techniques as follows:

1. Make the best use of time, place and environment.

2. Practice active listening to understand stakeholder's concern. You do not have to agree with them; just establish the fact that they are being heard.

3. Take breaks from the negotiations in order not to be pressurised into making hasty, unwise or rapid decision. Do not be pressurised to "take it or leave it" ultimatum.

4. Use single text documents, written procedural agreements, timetables or substantive terms and condition.

5. Recognise and counter manipulative tactics and rude behaviour.

6. Establish a reputation for fairness, follow-through and reliable implementation of agreements.


Conclusion

In an increasingly complex security landscape, effective defence decision-making in the RMAF requires a holistic approach that integrates leadership, cognitive awareness, systems thinking, and negotiation skills. Decision-making with systems perspective is a key leader's competency. With systems thinking, RMAF commanders will have the ability to make decisions with a whole system in mind, understand both internal and external eco-system, capitalise on or respond to existing and emerging issues. In addition, commanders could strategically position the organisation within its environment and create synergistic/ symbiotic relationships both within organisation and external factors.

RMAF commanders must be adept at fostering team cohesion, mitigating cognitive biases, leveraging analytical frameworks, and engaging in principled negotiations to enhance coordination across government and non-government agencies for WOG response. Tools and skills set provided for defence decision-making acquired from the Institute of Security Governance may results in great benefit to RMAF commanders at the strategic, operational and tactical level. By equipping commanders with these competencies, the RMAF can enhance its operational effectiveness and contribute to a resilient national security framework.

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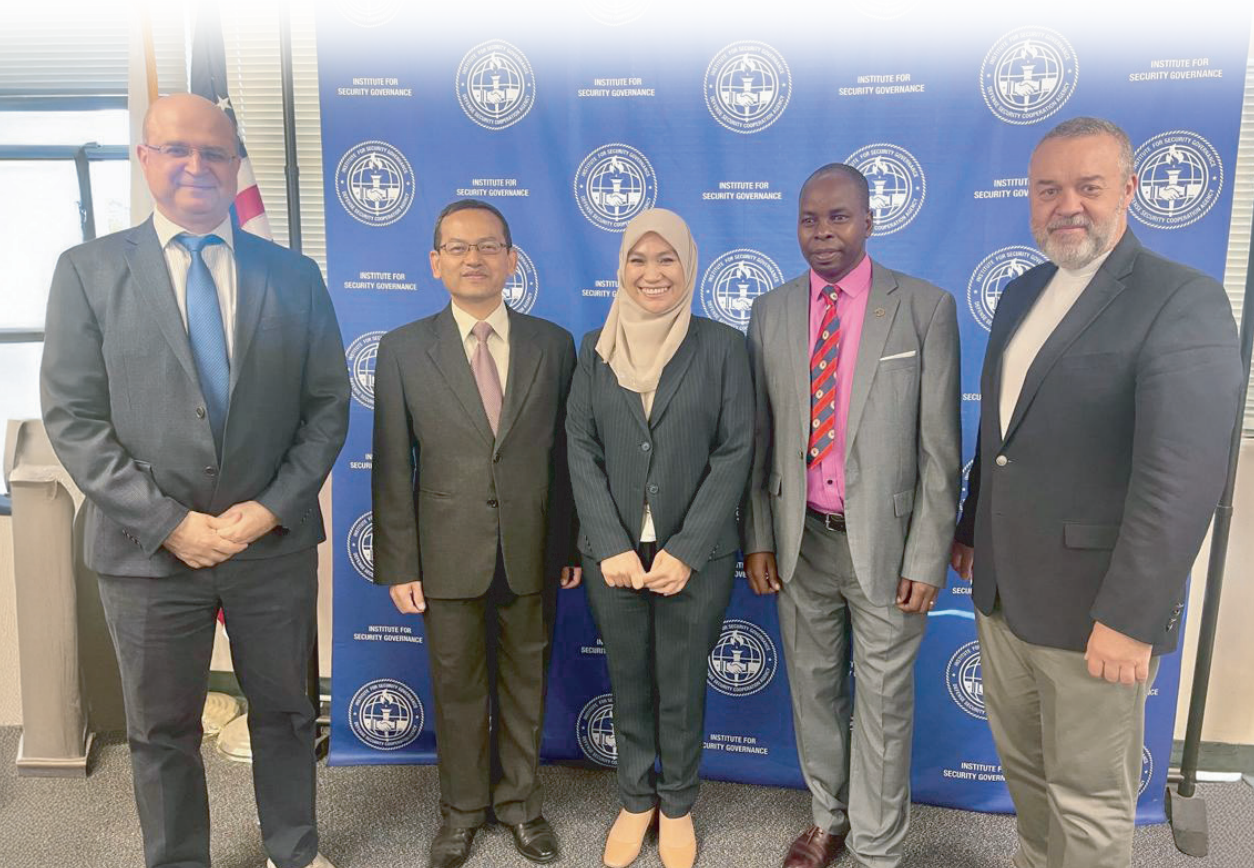
MARITIME TERRORISM IN MALAYSIA: HOW THE RMAF IS RESPONDING TO THIS EMERGING THREAT
by LT COL MOHAMAD ZAINI BIN ZAINORIN RMAF

Introduction

As a maritime nation, Malaysia holds a strategic position within the Southeast Asia region because of its vast coastline and extensive maritime domain. With a total area of 569,845 km2, the maritime domain has played a pivotal role in shaping Malaysia's history, culture, and economy.

Throughout the centuries, Malaysia has been a hub for maritime trade, attracting merchants from various parts of the world and facilitating the exchange of goods, ideas, and cultures. Malaysia's dependency on the sea is significant today, where its ocean economy contributed USD 63 billion, or '23% to national gross domestic product (GDP) in 2015' (PEMSEA, 2021).

According to the Malaysian Investment Development Authority (MIDA), 'the maritime industry in Malaysia contributes about 40% of the country's GDP, and over 90% of Malaysia's exports are by sea' (MIDA, 2021).

Because of the importance of Malaysia's maritime domain, 'the opportunities for terrorists to conduct their activities continue to exist' (Wee, 2017). Hence, it is necessary to secure prosperity through the exploitation of maritime resources.

What is Maritime Terrorism

National security in Malaysia refers to 'a state of being free from any threat, whether internally or externally, to its core values' (MKN, 2022). Malaysia has experienced security challenges in the past, including 'colonisation by foreign powers, the Communist insurgency, the Indonesian Confrontation, secessionist movements, the 13 May 1969 ethnic conflict, extremism (ethnic, ideological, religious, and political), economic crises, natural disasters, and territorial infringements' (MKN, 2022).

The extremism and terrorism threats 'to Malaysia's security are growing, and from February 2013 to September 2019, the authorities arrested 511 individuals with suspected links to terrorism' (Defence White Paper, 2020). Extremism and terrorism are continuous 'global threats that have a direct impact on the security of Malaysia' (MKN, 2022).

The word terrorism has become an international legal issue and a growing security concern for every sovereign state. Defining terrorism is not an easy task since it is a complex phenomenon and would cause multifaceted answers. The different state may have their own interpretation and definition of terrorism.

According to (Zainorin, 2024), the definition of maritime terrorism in Malaysia's context emphasises the following:

1. Political, religious or ideological motivated.

2. The activities conducted at sea or in coastal areas (maritime environment), including maritime transportation.

3. The targets of terrorism are civilians and facilities in the maritime environment.

4. The intention is to intimidate the public and compel the government.

5. The essence of activity is the use of, or threat to use, violence.

The Impact of Maritime Terrorism On Malaysia's Security

The operation conducted by maritime terrorist groups, especially the incursion of the Royal Army of Sulu (RAS) in Sabah in 2013, has challenged the sovereignty of Malaysia. The RAS 'claimed that Sabah was part of the Sulu Sultanate' (Jawhar & Sariburaja, 2016) and compelled the Malaysian government 'to recognise the Sulu Sultanate, acknowledge that a part of Sabah belongs to the Sulu Sultanate, and demanded that Malaysia pay a sum of USD$7.5 billion as compensation to the group given that Malaysia, in their view, had been occupying Sabah since 1963' (Jawhar & Sariburaja, 2016). This act clearly questioned the legitimacy of the Malaysian government and challenged the territorial integrity of Malaysia in Sabah.

Most of maritime terrorist groups share the same ideology, which is 'to establish an Islamic State in the region' (El-Muhammady, 2023) by violent means such as the attack on vessels, kidnaps for ransom, and the planning to attack the maritime infrastructures. Their main objective in doing so 'is trying to create chaos and panic in the society and later will manoeuvre to the country's social and political instability' (Aslam, 2020).

The Strait of Malacca is 'one of the world's busiest shipping lanes and a natural choke point' (Sittnick, 2005) and 'about 60% of global maritime trade passes through this region' (Weekes, 2023). Sittnick (2005) expressed his concern for the security of the Strait because a maritime attack at Strait of Malacca may 'result in the loss of life, and it could significantly disrupt global shipping and have a tremendous impact on global market' (Sittnick, 2005).

Maritime terrorism also poses a significant impact on the tourism industry in Malaysia. The terrorist 'activities conducted by the Abu Sayyaf Group (ASG) and Jemaah Islamiyah (JI) in Malaysia bring a negative on tourism as reported by the international media' (Ayob & Masron, 2014). According to MATTA Sabah chairman, Mr J. L Tan, 'incursion in 2013 and series of kidnap for ransom activities in Sabah also bring a negative impact, with hotel and tour agencies receiving cancellation by holidaymakers' (The Star, 2013). It was very clear that maritime terrorism has reduced the economic capacity and may disrupt commercial transportation, especially in the Strait of Malacca and in the water of the state of Sabah.

The RMAF Responds To This Emerging Threat

The key to countering the threat of maritime terrorism is by having formidable intelligence. National and international security are becoming more reliant on information, particularly in the maritime environment, where operations extend further from ports and land and cover large areas of operation.

The terrorists would normally possess initiative and surprise due to the nature of their activities. Therefore, they must be located as far away from their potential targets as possible. According to (Singh, 2008), 'maritime counter-terrorism would have to link up with measure on land to sea and again on sea to land.' He added, 'Air (including space) power is the obvious major component of any intelligence-surveillance operations in this regard since there is simply no other means available to undertake the extensive role of reconnaissance, surveillance, and target acquisition for counter-terrorism in the maritime environment' (Singh, 2008).

In this regard, the Chief of Air Force, on his forward, emphasised that 'this situation encourages the RMAF to implement a transformation so that it possesses all the capabilities required to enable it to carry out its duties and roles effectively in two regions simultaneously, covering various domains across the entire strategic areas of Core, Extended, and Forward, as outlined in the Defense White Paper' (TUDM, 2021). Shaping the Military Affairs of the RMAF involves a combination of strategic planning, modernisation, organisational changes, and adapting to evolving

regional and global security threats. Over the years, the RMAF has focused on enhancing its capabilities, improving interoperability with other forces, and ensuring it remains agile in dealing with both conventional and asymmetrical threats, including the maritime terrorism threat. Hence, the transformation programs outlined in the RMAF Capability Development Plan 2055 (CAP55), of which Phase 1 of the plan started in 2021, is the best approach to addressing this emerging threat.

Currently, the RMAF relies on CN-235 MSA aircraft for conducting maritime air operations, especially in intelligence gathering, surveillance, and reconnaissance missions. Equipped with advanced radar systems and EO/IR sensors, they are capable of detecting, tracking, and identifying any terrorist activities. However, relying on this platform alone has limitations in conducting surveillance over the large areas of Malaysia's Maritime Zone and covering two theatres of operation.

Therefore, the RMAF CAP55 has prioritised the procurement of new MPA and MALE-UAS because they play a pivotal role in enhancing situational awareness, surveillance, and rapid response, making them essential in countering maritime terrorism. The RMAF new ANKA MALE-UAS and ATR 72 MPA each offer unique capabilities in the fight against maritime terrorism, which are expected to be delivered in 2025 and 2026, respectively.

The ATR 72 MPA and ANKA MALE-UAS can be used in tandem to provide comprehensive maritime surveillance. The ANKA can conduct high-resolution surveillance over specific areas or act as a quick-response asset to provide intelligence, while the ATR 72 MPA can cover broader areas and provide coordinated responses with naval forces for rapid interception. By combining the endurance of the ATR 72 MPA with the low-altitude, high-precision capabilities of the ANKA, maritime security forces can establish a multi-layered surveillance network.

This network ensures constant coverage of key maritime zones, improving response times to pirate attacks, hijackings, and terrorist activities. The ANKA UAS is well-suited for persistent low-level surveillance

and can provide real-time data to forces on the ground, while the ATR 72 MPA can provide long-range coverage and act as a command and control hub in operations, directing naval or air forces to neutralise maritime threats. Together, they form a powerful, integrated maritime surveillance and counter-terrorism network, ensuring a layered, multi-dimensional response to maritime threats, including terrorism, piracy, and illegal activities at sea.

The RMAF Intelligence Data Fusion Centre (IDFC) is a newly established component under the RMAF Air Warfare Centre (AWC), Air Operations Command HQ. IDFC is an essential component of any modern counter-maritime terrorism strategy. The role of the IDFC in counter-maritime terrorism is critical for integrating and analysing information from various sources to provide a coherent and actionable picture of maritime threats. These centres act as the operational hubs for intelligence sharing, analysis, and dissemination, supporting rapid decision-making and coordinated responses to maritime terrorism. It provides real-time situational awareness, coordinated responses, and early warning capabilities by integrating and analysing diverse intelligence sources.

The multifaceted roles of IDFC in counter-maritime terrorism are vital for enhancing maritime security. Certainly, IDFC significantly contributes to mitigating risks associated with maritime terrorism by fostering collaboration, providing comprehensive threat assessments, coordinating responses, and continuously monitoring the maritime domain.

Conclusion

In conclusion, the RMAF plays a critical role in addressing the emerging threat of maritime terrorism, a challenge that has the potential to disrupt Malaysia's economy, security, and sovereignty. The RMAF CAP55 marks a strategic approach to counter these threats, emphasising the need for modern capabilities that aim to create a robust and integrated maritime surveillance network that offers a multi-dimensional defence against maritime terrorism.

The transformation and modernisation efforts within the RMAF, as outlined in CAP55, ensure that Malaysia is prepared to face both traditional and asymmetric maritime security threats in the coming decades. The collaborative integration of air, sea, and intelligence capabilities offers a comprehensive solution to safeguard Malaysia's maritime interests, contributing to the nation's continued prosperity and security in an increasingly volatile global maritime environment.

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CRITICALLY EVALUATE THE EXTENT TO WHICH RELIGION MEDIATES THE CHARACTER AND ARTICULATION OF CONFLICT

by LT COL DZULHAZMY BIN ZAINAL ABIDIN RMAF

Introduction

Religion deals with things that are more than moral behaviour. Religion offers a worldview and answers to many perplexing questions. Religion encourages people to think not only of their own interests, but also of the interests of others. Good behaviour can grow out of such a worldview, but religious answers go beyond simply following conventional norms of behaviour.

Religion as a source of conflict seems paradoxical. On the one hand, religion is seen as a source of morals and values; on the other hand, it is seen as a source of conflict. Therefore, the discussion of religion as a factor in conflict is conducted in terms of the believer, not his religion, to determine the emergence of conflict. The discussion of religion as a factor in the occurrence of conflict starts with its adherents. However, the relationship between religion and conflict is a complex one. Religiously motivated peacemakers have played an important role in managing conflicts around the world.

It is not easy to assess the extent to whichh religion mediates and articulates the character of conflict. Starting with the history and current conflicts that can be associated with religion and its believers, we must assess the aspect of social and political relations and then determine the extent to which religion mediates the character and articulation of conflict.

Religion and Conflict

Religion is defined as any system of ideas and practises imbued with "holiness" or directed toward "eternal human suffering" of nontheistic belief systems, including communism, nationalism, and humanism, as well as an atheistic system based on the concept of supernatural powers. Religion is a universal part of human life in the sense that there are ways of thinking and behaving in every community that can be classified as religious.

Religion is a sociological concept that encompasses images, beliefs, symbols, and specific values through which people perceive their existence. . It is important to know that sociologists never say that one religion is better than another, and they never try to find out which religion is the most authentic. And is a form of human unity. Moreover, religion is a matter of faith, while sociologists are concerned with empirical questions, that is, with things that can be observed and measured.

A conflict Is defined as a miscommunication or disagreement between opposing organisations or ideas. The term can also be used to describe a conflict or an attempt to take opposing sides. In other words, it is a disagreement involving multiple parties. Social conflict is defined as a lifelong conflict between members of society when used in conjunction with the term social.

When a social contact or process breaks down between two or more people (perhaps a group), one party attempts to remove the other by destroying it or rendering it useless. Humans, as social beings, cannot exist without social, political, cultural, religious, and other forms of interaction. Individual differences in physical characteristics, intelligence, knowledge, customs, beliefs, etc., naturally lead to conflict in any civilization.

In other words, only the extinction of civilization will end the conflict. Many psychologists have studied conflict, especially violence, in relation to the inner qualities of human beings. Sigmund Freud, for example, saw conflict or violence as a form of

dissatisfaction stemming from a fundamentally human drive, and history has shown that humans have evolved to be predators of other humans.

We have witnessed the massacre of Muslims in Kosovo in the twentieth century, and the ongoing conflicts between Muslim Pakistan and Hindu India. We have heard of the ongoing persecution of the Uighurs in China and the oppression of the Rohingya in Myanmar, and the world is still witnessing the massacre of Palestinians, and the occupation of land by the Jews who created the state of Israel. Are these conflicts sparked by religion or their believers? There are no scriptures from any religion permit to do violence to others, yet the diversity should be adopted and adjust accordingly for the benefit of all.

Religion and Social Relations

In a society, religion plays an important role. Religion cannot be ignored in daily life, especially when the foundation of a society has been built on the application of religion since the beginning of time. There are two main elements of religion. Faith is the first dimension. Our relationship with God is determined by this part.

The second dimension is the social dimension, which calls us to apply the principles of religion in our daily lives to create a harmonious community. Religion can help people stay out of trouble while guiding them to become more organised.

George Simmel, one of the founding fathers of the sociology of conflict, viewed sociology from three perspectives: relationism, sociology, and social forms. According to Relationism, social aspects can only be understood about the whole and not in isolation. Social forms refer to the existence of social institutions such as the family, forms of social exchange, networks, and others, but also to the existence of social institutions such as the family. The term "society" refers to the process of linking the parts of a system to form society.

Cultural tensions, for example, are closely linked to development. Because culture and religion are both mobilising components, they are different variables. However, Phil believes that violence is primarily due to injustice and that rulers, religious and political leaders must recognise that fairness is a prerequisite for peace.

Religion, in the sociological sense, is a general social affliction that affects every community on the planet without exception. Even though people practise a variety of religions, all religions are sacred and serve as a guide for human behaviour as well as a rule and regulation to express a sense of unity with others.

In addition to this logical sense, each believer has a different interpretation and understanding of what they believe, depending on their individual abilities. From such differences in understanding can arise the roots of conflicts that occur in society if not avoided.

Religion and Political Relations

Religion plays an important role in politics. Religion is the foundation of culture and civilization and plays a role in all aspects of human life. The existence of several religions affects the behaviour of politicians both directly and indirectly. If all religions are considered sacrosanct, politicians will be able to distinguish between good and evil in every decision they make for the good of the people, the country and neighbouring countries.

Politics can be defined as the art of leading and controlling a country while preserving the independence, freedom, honour, and dignity of the people. Politics includes not only domestic problems, but also aspects of international relations.

Conclusion

These are just a few examples of how perceptions, beliefs, and desires can lead to and prolong conflict. This is proof that the existence of conflict comes from humans but not from religion. Most of the population, whether in religions, society, or politics, exhibit misinterpretations, assumptions, and a sense of "I am right, but you are wrong."

Religion plays no role in determining the nature and expression of conflict. However, a lack of adaptability and flexibility in the face of diversity, and an unwelcome zest for diversity, will lead to unpleasant circumstances and disputes.

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AIRCRAFT ACCIDENT INVESTIGATION IN RMAF: OVERVIEW AND STEPS INVOLVED
by MAJ MUSTAFFA KAMAL BIN YUSUFF RMAF

Introduction

BOI members are individuals who dedicate their time and energy to conducting investigations into accidents and occurrences. Accident investigation encompasses various aspects, including system failures, mechanical faults, organisational failures, and human issues. The primary purpose of an accident inquiry is to mitigate and avert future aviation incidents. The most effective approach is to conduct thorough examinations of many incidents in a methodical fashion, adhering to a series of stages to identify the underlying cause or causes of the accident. This will enable the implementation of measures aimed at preventing future occurrences of the same nature.

Typically, following an accident, there are multiple procedures involved in the investigation process. These processes encompass both administrative and operational procedures. The inquiry consists of several distinct stages, including fact-finding, analysis, and conclusion. This article aims to analyse the accident investigation process by providing an overview of an accident, scrutinising the factors related to the event, and applying one or two accident causation models to the inquiry. This article also elaborates on the correlation among the steps and their interconnectedness to conclude the accident inquiry.

Post Accident Actions

As soon as it is established that an accident has taken place, the notification step begins. During this process, the MTU-Inspectorate of the Royal Malaysian Air Force is informed about the accident. In addition, the higher echelon, the operator, the country of manufacturing, and the nation of registry of the aircraft that was affected are all taken into consideration. The investigating authority must respond immediately to notifications of accidents and incidents. The notification procedure should be streamlined and efficient, utilising the fastest modes of communication available. During the notification process, the site inspection typically occurs simultaneously.

At the scene, any survivors are retrieved, and diligent efforts are made to gather ample evidence, such as

photographs of the debris in its original state, prior to any interference. The images should also illustrate the victims' positions relative to the wreckage. It is crucial to promptly get as many photographs as possible, as certain evidence has a limited lifespan. For instance, traces on soft ground can be either blown away or stomped upon. Put simply, it is necessary to retain all physical evidence for as long as it is reasonably feasible. During their time at the location, the team of investigators also engages in conversations with the witnesses and arranges interviews whenever feasible. It is advisable to schedule the interviews as soon as possible, as the witnesses will have a more accurate recollection of the events.

Picture 2 : RMAF CN 235 aircraft crash at Kuala Selangor

Accident Investigation Process

Upon completion of evidence collection, the investigation can commence. An investigation can fall into two categories: a major accident investigation, which pertains to a large aircraft and typically involves fatalities, or a smaller investigation, which pertains to a smaller aircraft and usually involves less severe injuries to individuals. In a major accident investigation, a substantial team of investigators is usually necessary to cover all the aspects of the occurrence, and the team in charge should establish working groups to cover various functioning parts of the investigation.

In minor investigations, it is crucial that the level of personal commitment and meticulousness in accurately documenting the facts and conducting the analysis and findings be held to the same rigorous standards as in major accident investigations.

There are two primary perspectives when analysing occurrences: the person perspective, which focuses on identifying the responsible party, and the systematic perspective, which seeks to understand the underlying reasons for system failure. These two primary methodologies go further into the factors surrounding the accident or incident, and the factors that contribute to the occurrence typically operate in conjunction with the 'Domino Theory' (Heinrich, 1931).


Picture 3: The Domino Theory

Heinrich (1931) proposed that each component would trigger the subsequent phase in a sequential way, like a series of dominoes falling one after another. By removing just one domino, the continuous chain reaction of falling dominoes would be disrupted, preventing the accident and subsequent injuries. During an accident investigation, a series of actions are undertaken to reconstruct the sequence of events leading to the accident. This process enables investigators to pinpoint the crucial factor that, if absent, would have prevented the disaster from happening. The fundamental purpose of accident investigation is to prevent future incidents. In order to identify where the dominoes first started toppling, accident investigators go through three main phases of accident investigation, which are:

1. Fact finding

2. Analysis

3. Conclusion

ICAO interprets these three phases as; collection of data, analysis of data, and presentation of findings (ICAO doc 9756 part 3 ch1.p1).
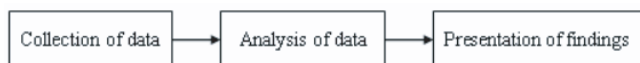
Picture 4: ICAO Investigation Process

The process consists of three main parts: securing the accident scene, gathering evidence, and analysing the sequence of events. Within these phases, specific procedures include evaluating the reasons for the accident, suggesting modifications, and ultimately composing the report (OSHA, 2014). It is crucial to bear in mind that during these three investigative procedures, it may occasionally be essential to return to the 'fact finding' stage after analysing the data. This allows the investigator to gather additional data to substantiate their findings from the analysis phase.

Subsequently, the team of investigators will do a subsequent analysis and subsequently report their findings and recommendations.

Fact Finding

The team of investigators obtains as many facts as possible, including evidence from the accident site, witness interviews, and aircraft and crew data. Prioritise perishable data. Data types to collect include accident details, meteorological, technical, and human variables. Accident details include date, time, location, departure, destination, and flight phase. Meteorological variables significantly impact flight conditions and aircraft performance. The technical details enable synthetic reconstruction and simulation.

Gathering human factors data is the most challenging task. Examine activities within the last 7 days and 72 hours before the accident, focusing on physiological aspects that may impact crew performance. The investigation process involves reviewing records such as owner's manuals, aircraft documents, flight crew logs, and SOPs to identify operational issues that may have contributed to the domino effect. Additional information can be gathered from Air Traffic Controller recordings related to the disaster (IHSA, 2014), emphasises that effective accident investigations focus on 'fact finding' rather than 'fault finding'. These factors were examined to assess their role in the accident.

Analysis

The team of investigators assesses the magnitude of the equipment's damage and the injuries sustained by both the living and deceased victims. Examining the events that took place immediately before the accident can assist in determining the main factors and the secondary factors that led to it. Analysis can be categorised into three distinct groups: Causal Analysis, Expert Analysis, and Organisational Analysis.

Causal Analysis

Causal analysis aids in identifying the underlying reasons, both direct and indirect, that contribute to a certain outcome. Both root causes (underlying issues that result in hazardous situations) and immediate causes (the specific actions or events that directly caused the accident) contributed to the accident. James Reason's accident causation model, known as the "Swiss Cheese Model".

The "Cheese Model" illustrates the prolonged existence of latent conditions within a system, during which the intended defences may occasionally fail, resulting in the alignment of vulnerabilities until a single "unsafe act" ultimately leads to an accident. According to Reason (1990), accidents do not have a single cause, and every accident or occurrence involves multiple concealed hazards within the organisation.

Each segment of cheese in the depicted model symbolises a safety measure or precaution that pertains to a specific hazard. The holes symbolise the

The Reason Model and Accident Causal Chain
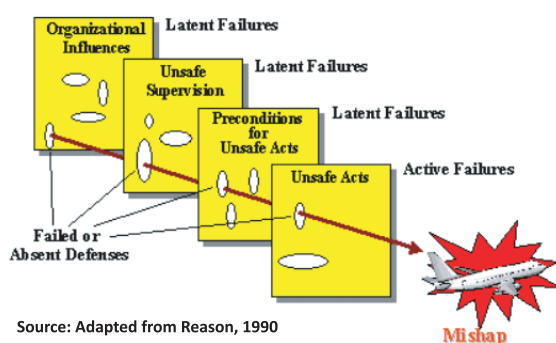
Source: Adapted from Reason, 1990

Picture 5: James Reason "Swiss Cheese Model"

ineffective or missing protective measures, which, when arranged in a sequence, result in an accident.

Expert Analysis

Multidisciplinary engineering specialists are needed for aviation accident expert analysis. This is because aviation is complicated. These professionals may specialise in aircraft accident reconstruction, risk management, flight data monitoring, metallurgy, forensics, human factors and performance, and aviation medicine. Additionally, experienced individuals with type ratings of the relevant aircraft or knowledge of key aspects of the study are consulted.

The accident's size and severity determine the skills needed and how far they will investigate. An accident on a light single-engine aircraft will not require reconstruction, but one on a large aircraft may. Each expert will use their expertise to piece together the evidence. The skilled analysts may analyse each flight phase-take off, climb, en route, approach, and landing.

Organisational Analysis

This examination evaluates if a system's behaviour aligns with the ideal organisation. Organisational analysis looks at management decisions and processes, even those with hidden flaws. Operations investigators may conduct some analysis, collecting data about the crew and organisation and cooperating with other organisations to complete the inquiry. During organisational analysis, the investigative group may review previous incidents or accidents to assess if the operator followed the advice from those incidents. Reason's (1990) accident causation model highlights the organisation as a factor in the process. According to Heinrich's (1931) domino theory, if one organisation fails, it can cause the rest of the dominos to fall and cause an accident.

Presentation of Findings

Typically, the results are conveyed in the format of a report. For each accident inquiry, there is both a preliminary report and a final report. The preliminary report serves to promptly distribute data collected during the initial phases of the investigation. The final report serves as the basis for implementing the essential safety measures to prevent future incidents stemming from similar causes. The final report should

derive safety recommendations based on its findings and reasons to facilitate the implementation of suitable preventative actions. The final report must comprehensively document all pertinent information, including any contradictory data, and conduct a thorough analysis of the relevant facts. It should present its conclusions in the form of findings and causes and make safety recommendations.

The act of making recommendations is the most influential aspect of an inquiry, as it establishes the solutions necessary to prevent future comparable incidents. It should be emphasised that achieving 100% answers is not achievable, but it is appropriate to strive for 80% solutions. The proposed remedies and recommendations should be economically efficient, pragmatic, and feasible. To improve system safety and lessen the likelihood of repeat incidents, they should also have a follow-up mechanism.

Summary and Conclusion

The investigation of aircraft accidents continues to develop with the passage of time and as technology advances. As the situation further develops, the team of investigators can arrive at conclusions and suggestions that are more refined. In this article, I examined the procedures that engage in an investigation into an accident, covering both the operational and administrative stages involved in the investigation. In addition, I determined the three stages of accident investigation, which are the discovery of facts, the analysis of those facts, and the report of those findings. Furthermore, I used Reason's (1990) Swiss cheese model in conjunction with Heinrich's (1931) domino theory to demonstrate how accident investigators can put together all the pieces of the puzzle. In conclusion, I emphasised the significance of the findings and recommendations, as well as the role that they play in the prevention of accidents in the future.

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TRAPPED GASES – AIR EXPANSION AT ALTITUDE
by MAJ (DR) NURUL AIN BINTI ABDULLAH

Introduction

Flying involves significant changes in barometric pressure, even at relatively low altitudes. These changes may cause severe medical problems unless the effects of barometric pressure change are understood and preventative measures taken. Gases behave in accordance with Boyle's Law (trapped gas). This chapter will explain the effect of pressure changes on gases trapped in the body. The human body can withstand enormous pressure changes provided the internal and external pressures are equalised. To enable pressure equalisation, all gas filled cavities are open to the atmosphere in a normal healthy individual. The bodies cavities affected by trapped gases are detailed in Table 1-1.

Ascent	Descent
gastro-intestinal tract	ears
lungs	sinuses
teeth	

Table 1-1. Gas-filled body cavities

Expansion Factors

Gas expands in accordance with Boyle's Law, which states: "A volume of a gas is inversely proportional to the pressure to which it is subjected, temperature remaining constant." Trapped gas will expand dramatically as altitude increases during ascending and vice versa on descent as shown in Picture 1-1.
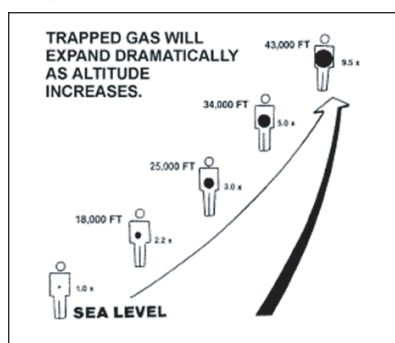
Picture 1-1. Boyle's Law

Gastro-intestinal Tract: usually vents easily and naturally

The human digestive system consists of the gastrointestinal tract plus the accessory organs of digestion as shown in Picture 1-2. The average human gastro-intestinal tract contains about 400ml of gas. Gas comes from swallowed air and gases emitted from bacteria in the gut. The gases are saturated with water vapour and expand as a wet gas. Expansion of a gas in the intestine causes noticeable bloating in the abdomen and considerable pain. Hyperventilation as a result of this pain can further complicate the problem. Hyperventilation is abnormal breathing that involves rapid and deep breaths. In some cases, fainting may occur (vasovagal syncope). If this occurs as a result of a rapid decompression, aircrew can be incapacitated and unable to control the aircraft. If flying at high altitude it is imperative that measures are taken to minimise intestinal gas before flight. It is advisable to avoid gas producing foods and carbonated beverages before flight. At low altitudes, trapped gas in the gastro-intestinal tract is not normally a problem. At high altitude, major problems are most likely when gas is trapped in the small bowel. Gas trapped in the stomach and the large bowel can normally be eliminated readily by belching or passing flatus.


Picture 1-2. Organs of the Digestive System

## Lungs: not a big problem in aviation

Over inflation of the lungs may cause rupturing of the tissue if the pressure differential is sufficient (80–100 mmHg). Air may be forced into the blood (air embolism), the pleura (pneumothorax) or the mediastinum which is the sac surrounding the heart and major blood vessels (pneumomediastinum). Pneumothorax (Picture 1-3) may cause chest pain, shortness of breath and a cough. If the pressure of the air in the pleural cavity (a thin, fluid-filled space surrounding the lungs) is high, it is known as a "tension pneumothorax" which may be fatal if not treated immediately. Air may also make its way up into the neck under the skin causing a condition called subcutaneous emphysema. Whenever a breath is taken, the pressures in the lungs and atmosphere equalise. Under normal circumstances, a rapid ascent is not a problem provided when breathe normally and airway is not blocked. The airway may be closed while coughing or straining (ie: when performing the Anti-G Straining Manoeuvre).
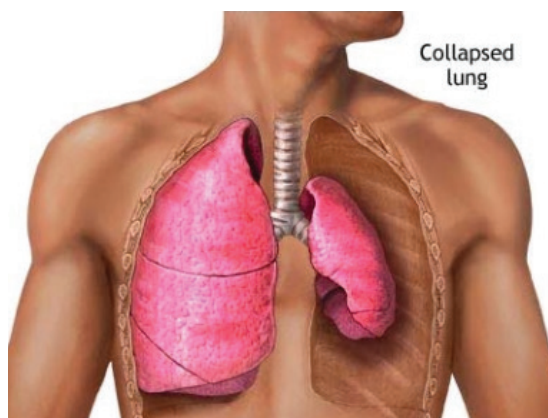
Picture 1-3. Left pneumothorax

The Teeth

Tooth pain (aerodontalgia) is a rare occurrence but may be caused by ascent to altitude if gas is trapped under a filling or in an abscess (Picture 1-4). Good dental hygiene and regular dental treatment may avoid this problem. The only action available while airborne is to descend to a lower altitude and seek dental treatment on landing. Tooth pain may be mistaken for sinus pain especially when it affects the upper teeth that sit just below the maxillary sinuses. Dental pain occurs during ascent whereas sinus pain is normally experienced during descent.
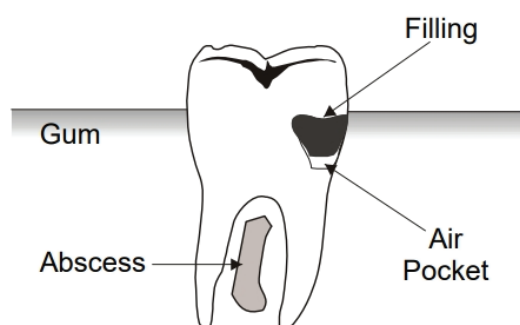
Picture 1-4. The Tooth

The Ears

Picture 1-5 shows that the anatomy of the ear is divided into three sections, the external, middle and inner ear. The middle ear is a gas filled chamber containing small bones (the ossicles) which transmit vibrations of the eardrum (tympanic membrane) to the hearing organ (cochlea). The middle ear is open to the atmosphere via the eustachian tube, a fine tube lined with mucous membrane with its opening at the back of the throat just above the soft palate (nasopharynx).
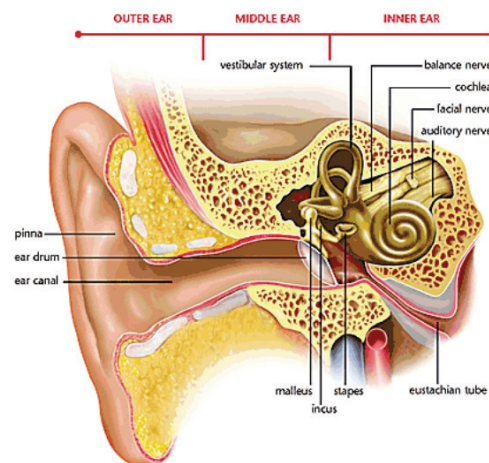
Picture 1-5. The Ear

Ascent: There is not normally a problem on ascent as gas moves freely from the middle ear cavity through the Eustachian tube maintaining a pressure equilibrium with the outside air. As the atmospheric pressure decreases, the internal volume will increase bowing the eardrum outwards. At the same time the eustachian tube is forced open allowing the excess air to freely escape. Yawning, swallowing or moving the jaw may assist this during the pressure change.

Descent: On descent, the inner ear volume decreases bowing the ear drum inwards creating a 'suction effect' on the walls of the eustachian tube as shown in Picture 1-6. This makes it difficult to force air into the middle ear cavity resulting in a pressure differential across the eardrum. As the pressure differential rises, discomfort will occur, which might result in a ruptured eardrum if valsalva manoeuvre is not done immediately.
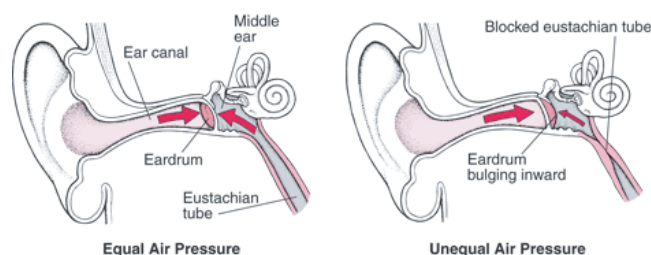
Picture 1-6. Equalizing ear pressure.

Prevention and Treatment:

The following method can help prevent ear problems on descent.

1. Active maneuvers such as swallowing, yawning, and jaw movements can open the eustachian tube and relieve the pressure.

2. Valsalva. The valsalva generates up to about 30mmHg pressure and is an effective method of equalising the pressure in the middle ear. Moving the jaw at the same time may also assist. Use only as much force as is necessary to clear the ears.

3. Use vasoconstrictors sprays. Nasal sprays dry out the mucous membranes and cause vasoconstriction, enlarging the diameter of the Eustachian tubes and sinus ducts. It is advisable to carry a nasal decongestant whilst flying for emergency use.

4. Ascend and then descend at a slower rate. By ascending, the pressure differential is reduced making it easier to clear the ears.

5. Equalize pressure frequently during descent.

6. **DO NOT FLY WITH A COLD.**

Valsalva Manoeuvre:

1. Moderately forceful attempted exhalation against a closed airway.

2. Forces air up Eustachian Tube and increases pressure in the middle ear.

3. Ineffective if pressure differential exceeds 90-120mmHg.

4. Must be brisk, easy and symmetrical.

Picture 1-7. Valsalva Manoeuvre

The Sinuses

The sinuses are gas-filled cavities in the skull (Picture 1-8) that are lined with mucous membranes and connected to the nasal cavity by small ducts. The sinuses are subjected to similar problems as the middle ear during pressure changes. Normally, gas is vented quite freely unless there are medical problems such as a cold, sinusitis or hay fever which block the passages allowing pressure to build up.

In sinus barotrauma, the onset of pain may be quite rapid and even incapacitating. Note the proximity of the maxillary sinuses to the upper teeth. Sinus pain may be mistaken for a toothache. Sinus barotrauma was attributed to a training accident some years ago in the USA where a student pilot flying a T-38 rolled inverted on short finals and impacted the ground.
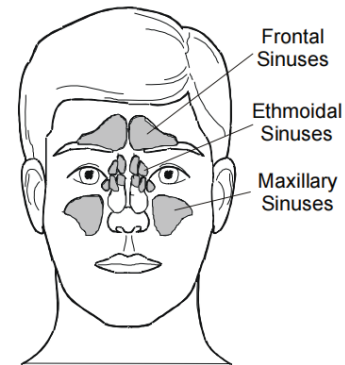
Picture 1-8. Sinuses

Prevention and Treatment:

To treat sinus problems on descent the following procedures should be done:

1. The Valsalva manoeuvre is sometimes effective by forcing air into the sinus cavity. If the pain is too severe, the pressure differential must be reduced as quickly as possible (ascending will achieve this). The 'Test Mask' setting on the O2 regulator may also help.

2. Use a nasal spray to clear the sinus ducts.

3. Reduce the aircraft/cabin rate of descent.

4. See medical officer if ill or unsure.

5. DO NOT FLY WITH A COLD OR SINUS PROBLEM.

Conclusion

Gases are forever present in the body. These gases act in accordance with the physical laws that govern them. If the gas becomes trapped and the escape route (individual opening for each area) is blocked, the resulting reaction tends to be very painful. Allowing the gas to escape and equalize with the surrounding environment alleviates the potential for problems.

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FUTURE WARFARE IN RMAF: CHALLENGES AND TRANSFORMATIONS
by MAJ MOHD JAMIL BIN AWANG RMAF

Introduction

The Royal Malaysian Air Force (RMAF) stands at a critical juncture as it navigates the evolving landscape of modern warfare. As geopolitical tensions rise in the Indo-Pacific region and military technology advances at an unprecedented pace, the RMAF must adapt to meet these challenges while operating within budgetary constraints and strategic priorities.

Malaysia's strategic position along vital maritime routes including the Strait of Malacca and the South China Sea, makes the modernization of its air force crucial for national security. The emergence of grey-zone warfare, hybrid threats and advanced anti-access/area denial systems in the region necessitates a fundamental rethinking of air force operations and capabilities.

Current State and Challenges

The RMAF currently operates a mixed fleet of aircraft including Russian-made Sukhoi Su-30MKM fighters, American F/A-18D Hornets, BAE Hawk 108/208 and various transport and training aircraft. However, many of these platforms are aging and the force faces significant challenges in modernization. The average age of RMAF's combat aircraft exceed 20 years, raising concerns about operational readiness and maintenance costs. For example, the F/A-18D Hornets, acquired in 1997, are approaching the end of their operational life, while Su-30MKMs face maintenance challenges due to parts availability and international sanctions affecting Russian military equipment.

Furthermore, the force must contend with limited defense budgets, which historically have averaged around 1% of Malaysia's GDP, significantly lower than many regional neighbors. For comparison, Singapore allocates approximately 3% of its GDP to defense while Thailand and Indonesia spend around 1.5% each. This budgetary constraint directly impacts the RMAF's ability to implement comprehensive modernization programs.

RMAF also faces challenges in maintaining operational readiness across its vast area of responsibility. For

instance, during the 2019 territorial dispute over the South China Sea, RMAF had to increase maritime patrol missions by 65% straining both personnel and equipment resources. The need to monitor activities across both peninsular Malaysia and East Malaysia requires significant logistical coordination and highlights the importance of having modern, reliable platforms.

Beyond hardware challenges, the RMAF must address the complexity of modern air operations in an increasingly contested electromagnetic spectrum. The proliferation of advanced air defense systems, electronic warfare capabilities and cyber threats in the region necessitates a comprehensive approach to future force development.

Technological Imperatives

The future of warfare demands that the RMAF embrace several key technological developments. Modern air forces must adapt to an increasingly complex battlespace where traditional air superiority alone is insufficient. RMAF's technological transformation must focus on several critical areas to maintain operational relevance and strategic deterrence.

RMAF's advancement into unmanned systems and autonomy represents a critical transformation for its future capabilities. The potential acquisition of proven platforms would significantly enhance RMAF's ISR and strike capabilities while providing a cost-effective

solution within Malaysia's defense budget constraints. This could be complemented by the development of indigenous UAV capabilities through the STRIDE program, which aims to create locally sustainable drone technology. RMAF's commitment to developing domestic expertise in unmanned systems is particularly crucial for maintaining technological sovereignty and reducing dependence on foreign suppliers. Furthermore, the force's exploration of swarm drone technologies, following demonstration by major powers, could provide a force multiplier effect for Malaysia's air defense capabilities particularly in protecting its extensive maritime borders and exclusive economic zones.

The integration of Artificial Intelligence and Machine Learning into RMAF operations presents transformative opportunities for enhancing force effectiveness and efficiency. By implementing predictive maintenance systems, RMAF could significantly reduce maintenance costs across its diverse fleet of aircraft which include Su-30MKM, F/A-18D and various transport aircraft. This is particularly relevant given the RMAF's current challenges with aging aircraft and maintenance resource optimization. The force's ongoing modernization efforts include the development of AI-driven battle management systems, drawing inspiration from successful implementations like the Joint Theatre Command and Control System. These systems would be specifically tailored to RMAF's unique operational environment, integrating data from maritime patrols over the South China Sea, territorial surveillance missions and counter-terrorism operations in the Sulu Sea region. The implementation of advanced machine learning algorithms for target recognition and classification would enhance RMAF's precision strike capabilities and reduce the risk of collateral damage during operations.

Network-centric warfare capabilities represent another critical area for RMAF's technological transformation. Taking lessons from neighboring country, RMAF is working to develop an integrated air defense network that connects all its assets across Peninsular and East Malaysia. This system would be crucial for maintaining comprehensive air defense coverage across Malaysia's geographically separated territories. The force's network-centric warfare development is specifically adapted to Malaysian requirements, focusing on integrating existing RMAF assets with new capabilities in a cost-effective manner. RMAF network-centric warfare initiative aims to create a resilient command and control structure that can operate effectively even in contested electromagnetic environments, particularly relevant given the increasing complexity of regional security challenges in Southeast Asia.

Operational Adaptations

Future warfare will demand significant changes in how the RMAF conducts operations. The concept of multi- domain operations will become increasingly important, requiring the force to operate seamlessly across air, space, cyber and electromagnetic domains. For instance, when conducting maritime patrol missions over South China Sea, RMAF aircraft must simultaneously manage electronic warfare threats, maintain secure communications in contested environments and coordinate with space-based assets for enhance situational awareness. This necessitates not only new technologies but also revised doctrine, training programs and organizational structures.

The RMAF must develop capabilities for distributed operations, moving away from traditional centralized air base concepts due to the geographic challenges, with territories separated by the South China Sea. This approach involves operating from multiple dispersed locations to increase survivability and operational flexibility. Such adaptation requires investments in mobile support equipment, rapid deployment capabilities and training for expeditionary operations.

Joint operations will become increasingly critical. The RMAF must enhance its ability to operate effectively with other branches of the Malaysian Armed Forces, as well as with regional allies and partners. This includes developing common operating procedures, compatible communication systems and regular joint training exercises.

Strategic Considerations

The strategic environment in Southeast Asia continues to evolve with increasing great power competition and regional tensions. The RMAF must balance its force development to address both traditional and non-traditional security challenges. This includes maintaining conventional deterrence capabilities while also developing abilities to respond to grey zone operations, humanitarian disasters and transnational threats.

Resource constraints will continue to influence strategy. The RMAF must pursue cost-effective solutions through selective modernization, increased use of simulation-based training and strategic partnerships with defense industry players. The force should also explore innovative acquisition strategies including leasing arrangements and joint development programs with regional partners.

Human Capital Development

Future warfare will place unprecedented demands on RMAF personnel. The force must develop a new generation of airmen and women who are technologically savvy, adaptable and capable of operating in complex, multi-domain environments. This requires significant investments in education and training programs including advanced simulation systems, cyber warfare training and joint operations exercises.

The RMAF must also address the challenge of recruiting and retaining technical specialists who can maintain and operate increasingly sophisticated systems. This may require new approaches to military career management and partnerships with civilian educational institutions.

International Cooperation

The complexity and cost of modern air operations make international cooperation increasingly important. The RMAF should strengthen existing partnerships and develop new ones, particularly in areas such as training, maintenance and technology development. Regional cooperation initiatives such as Five Power Defence Arrangements (FPDA), will remain valuable frameworks for developing and maintaining capabilities.

Summary

The future of warfare presents both significant challenges and opportunities for the RMAF. Success in this evolving environment will require careful balance between technological advancement, operational adaptation and strategic prioritization. The RMAF must pursue modernization and maintaining essential operational capabilities. Key priorities for the future include:

1. Development of unmanned and autonomous systems capabilities.

2. Integration of AI and machine learning technologies.

3. Enhancement of network-centric warfare capabilities.

4. Adaptation to multi-domain operations.

5. Strengthening of human capital development.

6. Expansion of international cooperation initiatives.

The RMAF's ability to navigate these challenges while maintaining its core mission of defending Malaysian airspace will be crucial for national security in the coming decades. This will require sustained commitment to modernization, innovation in operational concepts and strategic partnerships both regionally and globally.

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INITIAL PANS-OPS: INSTRUMENT PROCEDURE DESIGN
by CAPT MOHD HAZWAN BIN MOHAMAD RASIDI RMAF

Introduction

Instrument Procedure Design (IPD) plays a crucial role in ensuring the safety and efficiency of aircraft operation (Graffiths & Perterson, 2022). PANS-OPS, established by the International Civil Aviation Organization (ICAO), outlines the procedures for Air Navigation Service – Aircraft Operation. IPD involves developing Instrument Flight Procedures (IFP), including departure, arrival and approaches, that comply with regulatory standards while ensuring terrain clearance, obstacle avoidance, and efficient airspace use in civil or military aviation (Hoke & Morrow, 2018).

Initial PANS-OPS

Initial PANS-OPS focuses on the fundamental principles of instrument procedure design, ensuring compliance with standard obstacle clearance requirements, conventional navigation aids, and predefined airspace structures. These procedures primarily rely on ground-based navigation systems, such as VHF Omnidirectional Range (VOR), Instrument Landing System (ILS), Non-Directional Beacon (NDB) and Tactical Air Navigation (TACAN), which provide essential guidance for aircraft during approach and departure. Initial designs emphasize safety by establishing standardized minimum altitudes, approach paths, and holding patterns, which reduce the risk of terrain and obstacle conflicts (ICAO., 2020).

Advanced PANS-OPS

In contrast, advanced PANS-OPS incorporates modern navigation technologies and airspace management strategies to optimize flight procedures. Utilizing Performance-Based Navigation (PBN), Area Navigation (RNAV), and Required Navigation Performance (RNP), advanced procedures enable more precise and efficient routing, independent of traditional ground-based navigation aids (Smith, J., & Taylor, S., 2020). This transition allows aircraft to follow flexible, optimized flight paths tailored to operational needs while maintaining stringent safety standards (Allen, R., 2017).
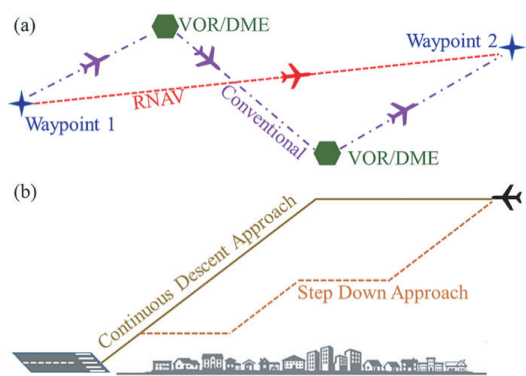

Picture 1. Overview of Initial and Advance PANS-OPS

Instrument Procedure Design In Initial PANS-OPS

Arrival and Approach Procedure

The approach and landing phase is the most critical part of an instrument flight, as aircraft transition from cruising altitude to landing under varying weather conditions (ICAO, 2020). PANS-OPS provides criteria for designing instrument approach procedures (IAPs) that ensure safe and stabilized descents. These procedures in Initial PANS-OPS include non-precision and precision approaches, such as those utilizing ILS, VOR, and NDB. Additionally, missed approach procedures are designed to provide an immediate escape path if landing cannot be safely completed.
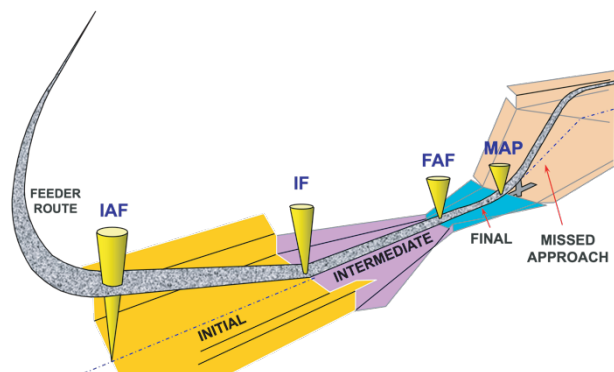
Picture 2. Arrival and Missed Approach Segment

To ensure safety, Minimum Obstacle Clearance (MOC) is a fundamental criterion applied in all phases of

Additionally, differentiation and integration in calculus are applied in modeling continuous descent approaches, determining rates of altitude change, and optimizing flight paths. Statistical and probabilistic methods are also used to assess risks and determine the likelihood of terrain or obstacle conflicts. A robust foundation in these mathematical principles is essential for PANS-OPS designers to develop safe and efficient flight procedures.

Drawing Process

The process begins by sketching the terrain and airspace structure on a standard aeronautical chart, ensuring that all relevant geographical and obstacle data are accurately represented. Designers then plot navigation fixes based on calculated coordinates, considering aircraft performance, required navigation accuracy, and obstacle clearance.

After plotting the primary elements, designers draw protection areas, including the Obstacle Clearance Surface (OCS), missed approach segments, and holding patterns, using precise scaling and measurement tools such as protractors, rulers, and aeronautical drafting templates to maintain accuracy.

Picture 6. Manual Calculation and Drawing

To streamline the design process and reduce errors, PANS-OPS designers can utilize specialized software tools. AutoCAD and AutoCAD Civil 3D allow designers to create highly detailed, scaled diagrams of instrument flight procedures with precision, integrating Geographic Information System (GIS) data for terrain and obstacle visualization.
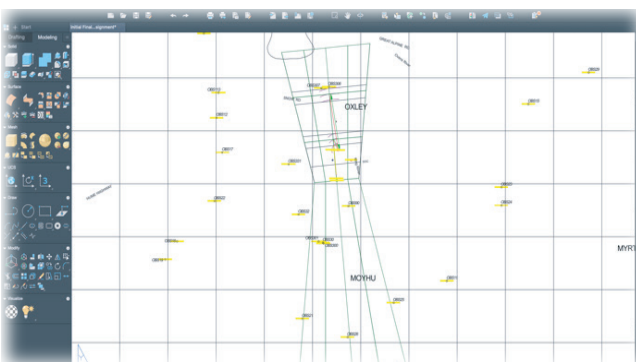
Picture 7. IFP Drawing on AutoCad

Flight Test, Promulgation, and Monitoring

After designing the IFP, it undergoes ground validation by regulatory bodies to ensure compliance with ICAO's PANS-OPS criteria, including obstacle clearance, navigation aid coverage, and procedural accuracy. It is then simulated using an FMS or flight simulators to detect anomalies before a flight validation aircraft conducts test flights. Inspectors assess terrain clearance, waypoint accuracy, navigation aid performance, and pilot workload. Any discrepancies require revisions and potential retesting to meet safety standards.

Once validated, the procedure is formally approved by CAAM and submitted to Malaysia Aeronautical Information Management (AIM) under Aeronautical Information Services (AIS) for publication. It is then incorporated into Aeronautical Information Publication (AIP) Malaysia (Part ENR and AD), providing official charts and instructions. Urgent implementations or temporary amendments are first issued via Aeronautical Information Circulars (AIC) or NOTAMs before full AIP integration (CAAM, 2021).

After promulgation, the IFP is continuously monitored for compliance. Pilots, ATC, and stakeholders report operational issues, and periodic reviews or revalidations are conducted if airspace conditions, terrain, or navigation aid performance change (Joel & Phil, 2017).

PANS-OPS IPD Software

Several specialized software solutions are available internationally for designing PANS-OPS IPD, helping ensure compliance with ICAO standards while improving accuracy and efficiency. These tools automate complex calculations, integrate geospatial data, and facilitate obstacle clearance assessments.

FPDAM (Flight Procedure Design and Management), use by the CAAM, which aids in generating instrument procedures by integrating aeronautical charts, navigation data, and ICAO PANS-OPS criteria to ensure regulatory compliance (CAAM, n.d.).

PANADES (Procedure for Air Navigation Services Aircraft Design and Evaluation Software) is widely recognize software, developed under ICAO's guidance, which supports PBN and conventional navigation procedures, including departure, enroute, and approach segments (ICAO., n.d.).

Airbus' TPDA (Trajectory Procedure Design and Analysis) software is specifically used for RNP and RNAV procedure design, integrating aircraft performance data, obstacle analysis, and airspace constraints to optimize flight paths (Airbus, n.d.).

IDS FPDAM (Flight Procedure Design and Airspace Management) by IDS AirNav provides a comprehensive suite for airspace and procedure design, supporting ICAO PANS-OPS calculations, terrain analysis, and obstacle assessment to ensure safe and efficient flight procedures (IDS AirNav., n.d.).
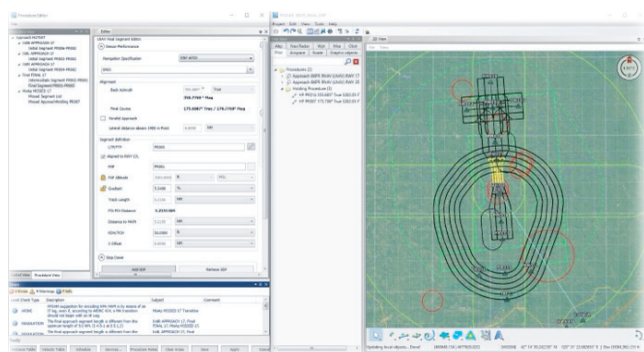
Picture 8. FPDAM Software

These software solutions enable aviation authorities, air navigation service providers and airlines worldwide to develop and validate flight procedures efficiently while ensuring adherence to global aviation safety standards.

PANS-OPS in Royal Malaysian Airforce (RMAF)

The RMAF faces several challenges in PANS-OPS development, limiting its ability to achieve airspace superiority and support military aviation effectively with fewer than ten experts available to design and manage IFP. This shortage restricts the RMAF's ability to independently develop or modify airspace procedures to suit military operations. Additionally, the RMAF lacks dedicated software for PANS-OPS design, forcing reliance on external tools and expertise. Compounding this issue is the absence of a specialized department within the RMAF to oversee IFP, making coordination and continuity difficult. Most critically, the RMAF has no legal authority to develop its own procedures, depending entirely on the CAAM for design and approval, which incurs additional costs and delays. This reliance limits the RMAF's ability to optimize airspace usage for tactical operations, combat readiness, and national defense needs.

To overcome these challenges, the RMAF must establish an in-house PANS-OPS division under the Air Operations Command Headquarters, dedicated to designing and managing military-specific instrument flight procedures. This will enable greater control over military airspace, reducing dependence on CAAM. Additionally, the RMAF should expand its pool of trained personnel by sending officers for ICAO-certified training or collaborating with international air forces to gain expertise in military airspace management. To address the lack of software, the RMAF should invest in PANS-OPS tools that allow for independent procedure design tailored to military needs. Furthermore, policy reforms should be pursued to grant the RMAF legal authority over military airspace procedures, reducing reliance on CAAM. Finally, regional and allied partnerships with countries like Singapore, Indonesia, and Australia can provide valuable knowledge-sharing opportunities, enhancing the RMAF's capability in designing and implementing mission-specific flight procedures. By taking these steps, the RMAF can achieve greater autonomy, improve operational efficiency, and strengthen its position as a regional leader in military aviation and airspace management.

Picture 9. Certificate of Initial PANS-OPS

Conclusion

PANS-OPS provides a robust and standardized approach to instrument procedure design, ensuring safe and efficient flight operations for both civil and military aviation. By enhancing operational efficiency while maintaining compliance with international safety regulations, these procedures play a critical role in modern airspace management (CAAM, 2020). As aviation technology continues to evolve, RMAF must not be left behind. Proactively adopting PANS-OPS advancements will strengthen mission readiness, operational efficiency, and national defense capabilities in an increasingly complex aviation environment.

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Penciptaan Pertama Negara
SIMULATOR FIGHTER (MOBILE)
PERINGKAT DUNIA
FIGHTER INTERACTIVE TRAINER SYSTEM

NATIONAL AND WORLD INNOVATION RECOGNITION: A LEGACY OF PROBLEM-SOLVING AND CREATIVE IDEA
by MAJ HAIRUL ZAIMY BIN IBRAHIM RMAF

Introduction

The journey of innovation in the Royal Malaysian Air Force (RMAF) began with a simple yet powerful mission: solving operational challenges through structured problem-solving initiatives. At the heart of this endeavours was the **Kumpulan Inovatif dan Kreatif (KIK)**, a pioneering platform that empowered personnel at all levels to develop practical solutions tailored to the Air Force's unique needs. Initially designed as an internal mechanism to enhance efficiency and optimize resources, KIK has since evolved into a cornerstone of RMAF's continuous improvement strategy.

Horizon Baharu Kumpulan Inovatif & Kreatif (HBKIK): New -Transforming Ideas into Structured Success

The HBKIK platform remains deeply rooted in **problem-solving methodologies**, enabling RMAF personnel to systematically address challenges using data-driven and creative approaches. However, beyond internal improvements, RMAF recognized that the best way to test the viability of these innovations was through competitive platforms where ideas could be refined, evaluated, and benchmarked against global standards.

The KIK framework within RMAF has developed into a structured system that fosters both **technical and operational excellence**. It is categorized into two types of competition:

1. **Hybrid KIK** – A multidisciplinary approach that integrates various expertise to solve complex challenges.

2. **Primer KIK** – A focused initiative aimed at refining and optimizing specific processes within the AirForce.

Beyond the structural evolution of KIK, innovation within RMAF is further classified into two key areas *(Penyampaian Perkhidmatan and Sosial)* while each innovation effort falls under one of two categories *(Penciptaan & Penambahbaikan)*.

To validate and showcase its groundbreaking advancements, RMAF has actively participated in numerous innovation competitions including Anugerah Inovasi Kementerian Pertahanan (**AIKP**), Anugerah Inovasi Perkhidmatan Sektor Awam (**AIPSA**) and Seoul International Invention Fair (**SIIF**). These platforms have not only provided a stage to

demonstrate its cutting-edge capabilities but have also solidified Malaysia's reputation in the global defence innovation landscape.

Through this structured approach, RMAF ensures that innovation is not merely an abstract concept but a tangible, results-driven strategy that enhances national security and operational readiness.

With an unwavering commitment to progress, RMAF's innovation ecosystem continues to expand, setting new benchmarks and redefining the future of air defence. As KIK transitions from an internal solution framework to an internationally recognized standard, the RMAF remains steadfast in its pursuit of excellence continuously pushing boundaries to secure the skies and inspire the next generation of innovators.

Airforce Outstanding Achievement In The Ministry of Defence 2023: Overkill Idea KIK Competition

The RMAF has once again demonstrated its excellence in innovation by securing remarkable achievements in the Ministry of Defence (MINDEF) KIK Competition 2023. This success highlights RMAF's commitment to enhancing service delivery, improving operational efficiency, and driving social innovation within the defence sector.
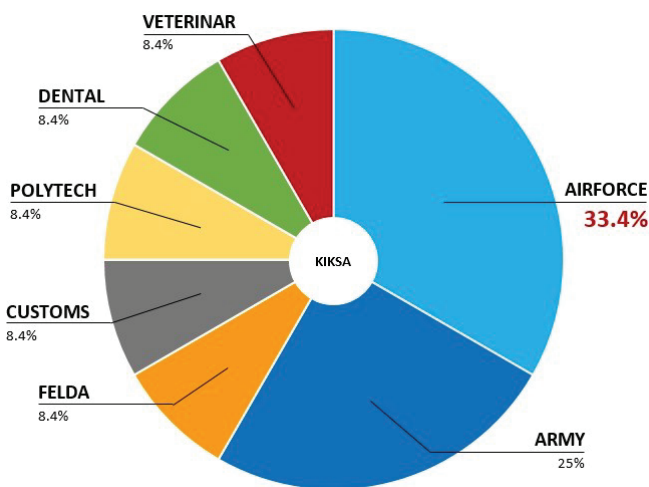
In the KIK Primer Penyampaian Perkhidmatan – Kategori Penciptaan, Sekolah Latihan Pegawai emerged as the champion with its Cartridge Destroyer, an innovative solution that enhances the safety and efficiency of ammunition disposal. No 8 Skn, PU Subang secured the runner-up position with its Ramp Toes Shoes Extension (RTSE), an innovative ramp toe designed for the A400M aircraft to facilitate the loading of heavy machinery without damaging the aircraft structure.

For the KIK Primer Penyampaian Perkhidmatan – Kategori Penambahbaikan, Cawangan Kejuruteraan, PU Kuantan was crowned champion with the Radar Processor Interface Device (RAPID), which significantly improves radar processing capabilities. No 12 Skn, PU Gong Kedak earned the runner-up position with its

Jammer Pod Lifting Trolley, an innovation designed to facilitate the handling of the SAP-518M Jammer Pod for the Su-30MKM, improving operational efficiency and safety.

In the KIK Primer Inovasi Sosial – Kategori Penciptaan, No 14 Skn, PU Labuan claimed the champion title with its Detachable Elastic Barrier (DEB), a practical solution to enhance aircraft and ground operation security. Cawangan Kejuruteraan, PU Labuan secured the runner-up position with its SMART – Power Distribution Unit (SMART – PDU), a modernized power management system designed to optimize energy efficiency and reliability.

For the KIK Primer Inovasi Sosial - Kategori Penambahbaikan, Cawangan Tadbir, PU Subang emerged as the champion with its Digital Defect Report (DDR), a digital reporting system that enhances maintenance efficiency and accuracy. Institut Teknologi Aerospace (ITAS) secured the runner-up position with its Advance Water Cooler System Aqua (A-Wacs Aqua), an upgraded water dispenser that provides clean and efficiently cooled water, improving access to safe hydration.

TUDM also showcased its expertise in the KIK Hybrid category. In Penyampaian Perkhidmatan, No 16 Skn, PU Subang secured the champion title with its Knight Bi-Electronic System (K-BEM), a cutting-edge technology designed to enhance operational readiness through advanced electronic integration. Cawangan Operasi, PU Subang secured the second runner-up position with Silent Screamer, an innovative bird repellent system that effectively reduces the risk of bird strikes, enhancing flight safety.

In KIK Hybrid Inovasi Sosial, PULATIBANG III, PU Kuantan won the champion title with its Alert Extender (ALEXANDER), an advanced alert system that improves communication and situational awareness in critical operations. PLTT Angkut, PU Subang secured the runner-up position with its Virtual Avionic Simulator Trainer 2.0 (VAST 2.0), a modernized avionics simulation training system that enhances the effectiveness and realism of aviation training.

The exceptional achievements of RMAF in the MINDEF KIK Competition 2023 underscore its unwavering commitment to continuous innovation, efficiency, and operational excellence. These groundbreaking projects not only strengthen Malaysia's defence capabilities but also contribute to the advancement of military technology. This success reaffirms RMAF's position as a leader in defence innovation, setting a benchmark for future advancements in military operations and service improvements.

Congratulations to all the teams for their remarkable contributions to innovation and excellence. RMAF remains dedicated to pioneering new technological solutions, ensuring a more advanced and secure future for the Malaysian Armed Forces.

RMAF excels at AIPSA 2023: Record-Breaking Victory

The RMAF continues to achieve outstanding success, emerging as the Champion of the *Anugerah DNA Inovasi Sektor Awam* (ADISA) at the 2023 Anugerah Inovasi Perdana Sektor Awam (AIPSA). This prestigious event was officiated by YAB Dato' Seri Anwar bin Ibrahim, Prime Minister of Malaysia, at the Putrajaya International Convention Centre (PICC), themed "Malaysia MADANI Memperkasa Inovasi."

This remarkable achievement marks a significant milestone for RMAF, proving the excellence and competitiveness of its innovative teams in the defence sector. *The Anugerah DNA Inovasi Sektor Awam* (ADISA) was won through the project "**Revolution Advance Innovation Network (RAIN)**" which is a cutting-edge Forward Looking Infrared (FLIR) system for the EC725AP aircraft. This milestone highlights the RMAF's dedication to innovation, enhancing operational capability and setting a new benchmark for the defence sector.

A total of 10 teams competed in AIPSA, with three (3) teams participating in the *Anugerah Inovasi Sektor Awam* (AINSA) and seven (7) teams in ADISA. The initial screening for this competition took place at Mercure Hotel, Penang, before the award ceremony was held at PICC, Putrajaya.

Dominance In The Kumpulan Inovatif dan Kreatif Sektor Awam (KIKSA)

In addition to the main victory in ADISA, RMAF also secured four (4) awards in the Kumpulan Inovatif dan Kreatif Sektor Awam (KIKSA), marking the largest victory in the history of RMAF and the Ministry of

Defence innovation. The outstanding achievements in KIKSA are as follows:

1. **Virtual Avionics Simulator Trainer 2.0 (VAST 2.0)** – 1st Runner-Up Inovasi Sosial Kategori Penambahbaikan.

2. **Silent Screamer** – 1st Runner-Up Inovasi Penyampaian Perkhidmatan Kategori Penciptaan.

3. **Alert Extender (ALEXANDER)** – 1st Runner-Up Inovasi Sosial Kategori Penciptaan.

4. **Knight Bi-Electronic Management Systems (KBEMS)** – 3rd Place Inovasi Sosial Kategori Penambahbaikan.

The unwavering commitment of RMAF's innovation teams has borne fruit with these remarkable achievements in KIKSA. A total of 12 RMAF teams participated in the competition, which took place at Tenera Hotel, Bangi, from 3rd to 5th October 2023, before the award ceremony was held at PICC, Putrajaya.

Intense Competition and Historic Victory

RMAF's participation and outstanding victories in AIPSA and KIKSA demonstrate the capability of its innovation teams in delivering creative solutions that enhance operational efficiency and the effectiveness of the nation's air defence systems.

Congratulations and Well Done!

This victory not only elevates RMAF's name but also brings pride to the Malaysian Armed Forces (MAF) and the Ministry of Defence as a whole. Congratulations to all RMAF Innovation Teams, the RMAF Innovation Secretariat, and the Ministry of Defence Innovation Icons for their dedication and high fighting spirit.

RMAF continues to move forward as a leader in defence innovation. With an unwavering spirit, this success serves as a catalyst for even greater achievements in the future.

RMAF Triumphs At The Seoul International Invention Fair 2024

The RMAF achieved outstanding success at the Seoul International Invention Fair (SIIF) 2024, held in Seoul, South Korea, from November 27 to 30, 2024. The event featured 519 innovation teams from 32 countries, evaluating projects in health, environment, and information technology.

Led by Lt Col Mohamad Rosdzni bin Abdul Karim RMAF, the RMAF team demonstrated exceptional innovation, with Maj Mohd Haziq Izzat bin Sulaiman RMAF (Project RAIN) and Maj Hasif bin Yahaya RMAF (Project RWR B-Sensing) receiving high acclaim. Additionally, strategic contributions by Maj Hairul Zaimy bin Ibrahim RMAF further strengthened the team's performance.

The delegation's participation resulted in significant achievements, including global recognition, prestigious international awards, and expanded collaboration opportunities. This success underscores RMAF's commitment to innovation and enhances Malaysia's global reputation in technological advancements.

The exhibition yielded several key accomplishments, including:

Ser	Innovation Project	Achievement	Organizer
(a)	(b)	(c)	(d)
1.	Revolution Innovation Advance Network (RAIN)	a. Gold Medal	SIIF Organizer
		b. Gold Medal	Special Award for World Collaborative Idea -Thailand
2.	RWR Blind Sensing	a. Silver Medal	SIIF Organizer
		b. Gold Medal	Special Award for World Collaborative Idea -Vietnam

Table: Achievements of Seoul International Invention Fair (SIIF) 2024

Conclusion

The successful execution of RMAF's innovation programs this year marks a significant milestone in our journey of excellence and creativity. By adhering to well-structured strategies and objectives, RMAF not only met its goals but also strengthened its reputation by securing victory in a world-class innovation competition. This achievement highlights the power of innovation, teamwork, and unwavering commitment to excellence. It reflects our ability to transform ideas

into impactful solutions that resonate globally, validating the effectiveness of our methodologies, the ingenuity of our innovations, and the dedication of our team.

Looking ahead, we are committed to building on this success by integrating key learnings, refining our innovation processes, and exploring new opportunities to sustain our leadership in technological advancements. This accomplishment not only reaffirms our capabilities but also sets a benchmark for future initiatives, inspiring us to push the boundaries of creativity and impact.

The Inspectorate remains confident that RMAF will continue to excel in future projects and competitions, upholding the 20th Chief of RMAF's fourth *Perintah Ulung*:

"**Mengoptimumkan Pengurusan Sumber dan Meningkatkan Budaya Inovasi**".

INTEL FUSION OPERATION INTERROGATION (IFOI) AND UNMANNED AERIAL SYSTEM (UAS) OPERATION PLANNING IN ROYAL MALAYSIAN AIR FORCE (RMAF)

by CAPT MUHAMMAD ZUHAIRI IZZAT BIN ZOLKEPLE RMAF

Unmanned Aerial Systems and Their Strategic Importance in Modern Warfare

The evolution of warfare has been significantly influenced by technological advancements, particularly through the incorporation of Unmanned Aerial Systems (UAS). These innovations have transformed military operations, providing enhanced capabilities for intelligence gathering, surveillance, reconnaissance, and offensive actions. This article examines the concepts of Intel Fusion Operation Interrogation (IFOI), UAS Operation Planning, and their implications for organizations like the Royal Malaysian Air Force (RMAF), showcasing how these elements are reshaping contemporary military strategies.

Intel Fusion Operation Interrogation (IFOI)

Intel Fusion Operation Interrogation (IFOI) represents a multi-faceted approach to intelligence gathering that emphasizes the integration of diverse data sources. In military contexts, the synthesis of information is essential for developing a comprehensive understanding of operational environments. IFOI allows for the fusion of various intelligence types—signals intelligence (SIGINT), human intelligence (HUMINT), and imagery intelligence (IMINT)—into cohesive insights that guide decision-making.

In practice, IFOI enables military leaders to assess the battlefield effectively, providing critical information regarding enemy movements, capabilities, and intentions. This holistic view is crucial for planning operations and executing missions with precision. By employing advanced data analytics and visualization techniques, military analysts can manage vast amounts of information, thus increasing situational awareness and reducing response times during critical engagements.

Operational Distinctions of IFOI: RMAF and Royal Malaysian Navy (RMN)

The IFOI processes in the RMAF and the RMN differ significantly in their operational focus, types of intelligence gathered, applications, and the technological tools used. The RMAF primarily concentrates on aerial operations and air defense, gathering intelligence related to airspace, enemy aircraft, and missile threats. This involves real-time aerial surveillance and reconnaissance, leveraging radar and satellite data for comprehensive airspace coverage. In contrast, the RMN focuses on maritime operations, where IFOI processes emphasize naval intelligence, including threats from the sea, shipping patterns, and maritime security. The applications of IFOI also vary; RMAF uses it to enhance air mission planning and manage airspace control, while RMN implements it for naval task force planning and anti-piracy operations. Coordination and collaboration further differentiate the two branches; the RMAF may partner with other air forces for joint operations, whereas the RMN often works alongside international maritime agencies and regional navies to ensure maritime security.

Additionally, the technological tools employed highlight these differences, with the RMAF utilizing advanced aerial reconnaissance platforms like surveillance drones and fighter aircraft, while the RMN relies on naval assets such as frigates, submarines, and maritime patrol aircraft to detect surface and subsurface threats. Understanding these distinctions clarifies how each branch approaches intelligence gathering and operational planning tailored to their specific missions.

The Rise of Unmanned Aerial Systems (UAS)

Unmanned Aerial Systems are becoming cornerstones of modern military operations. These systems are designed to operate without the direct presence of pilots, which allows military forces to undertake dangerous missions while minimizing human risk. UAS can vary widely in size, capability, and application, ranging from small drones for reconnaissance to large systems capable of carrying out airstrikes.

The integration of UAS into military operations has demonstrated several advantages. One primary benefit is their ability to provide real-time data and intelligence. Armed with advanced sensors and surveillance equipment, UAS can conduct prolonged

monitoring missions, offering commanders critical insights that were once challenging to acquire. Additionally, UAS can operate in environments that may be too hazardous for manned aircraft, thus increasing operational flexibility.

Operational Planning for Unmanned Aerial Systems (UASOP)

Operation planning for UAS, often referred to as UASOP, is a crucial process ensuring that these systems are deployed effectively in accordance with mission objectives. The planning phase encompasses several key components, including mission definition, environmental assessment, and resource management.

Successful UASOP begins with a clear identification of mission goals. Military planners must determine the specific tasks that UAS will undertake—be it surveillance, reconnaissance, or direct engagement. Once objectives are outlined, planners analyze the operational environment, considering factors such as terrain, weather conditions, and potential threats. This comprehensive understanding enables military forces to deploy UAS where they will be most effective.

Resource management is another critical element of UASOP. Effective logistical planning ensures that all necessary equipment, personnel, and support systems are in place. As UAS operations may involve coordination across multiple military branches, inter-agency cooperation is essential for achieving seamless integration during joint operations.

The Role of the Royal Malaysian Air Force (RMAF)

Within the context of Southeast Asia, the Royal Malaysian Air Force (RMAF) serves as a prime example of how UAS and IFOI are employed to enhance national defense. The RMAF has been proactive in adopting UAS technology to strengthen its operational capabilities, recognizing the growing complexities of regional security challenges.

The implementation of IFOI within RMAF allows for the effective analysis of data collected from UAS operations. By merging intelligence streams and employing data analytics, RMAF planners can make informed decisions that enhance situational awareness and refine operational responses. Furthermore, the RMAF's focus on UAS integration demonstrates a commitment to modernization and efficiency in tackling contemporary threats.

Challenges Associated with UAS and IFOI

While the advantages of UAS and IFOI are substantial, several challenges must be addressed. Technological vulnerabilities pose risks to UAS operations. Cybersecurity threats, such as hacking and jamming, can compromise the effectiveness of unmanned systems, potentially jeopardizing sensitive missions.

Moreover, the reliance on data-driven intelligence raises questions about information integrity. Ensuring the accuracy and relevancy of data is critical; the consequences of misinformation can lead to flawed operational decisions. Therefore, thorough vetting and validation processes for intelligence inputs must be instituted.

Ethical considerations also emerge in discussions of UAS and IFOI. The potential for collateral damage in drone strikes raises moral questions about the use of unmanned systems in warfare. Militaries must weigh the immediate operational benefits against the long-term implications of such military actions.

Conclusion

The integration of Intel Fusion Operation Interrogation (IFOI) and Unmanned Aerial System Operation Planning (UASOP) in RMAF represents a strategic enhancement of intelligence capabilities and operational efficiency. To capitalize on this potential, there is a need for investment in advanced analytics and AI technologies to refine data fusion and interpretation, along with upgrading drone capabilities for improved sensors and extended flight times. Comprehensive training programs should be implemented to equip personnel with the necessary skills to effectively manage these technologies, while cross-disciplinary training will facilitate better integration between intelligence and operational teams. Fostering collaboration with technology companies and defense contractors will ensure access to cutting-edge solutions, and joint exercises with allied forces can enhance interoperability. Moreover, developing clear policies on the ethical use of intelligence and drone operations is crucial to ensure compliance with international laws. Finally, establishing systems for constant evaluation and feedback will allow RMAF to adapt to evolving threats and technologies, thereby maximizing the effectiveness of its intelligence and drone operations while enhancing overall security and operational readiness.

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LOGISTICS READINESS IN ROYAL MALAYSIAN AIRFORCE (RMAF)
by MAJ MUHAMMAD HAFIZ BIN KAMARUDDIN RMAF

Overview

Logistics readiness is a primary foundation of any military's operational success in warfighting missions. It ensures that personnel are equipped with suitable assets, equipment is ready to be used, and resources are available and fully functional to achieve mission objectives. Logistics is defined as the planning and executing of the movement and maintenance of forces. It includes the provision of services and the sustainment of operations to achieve mission success.

Background

Malaysia is a country that consists of West Peninsular Malaysia and East Peninsular Malaysia, separated by the South China Sea (SCS). It's the main international airline and seaway for international trade among Asian countries. Separated landmasses allow Malaysia to possess a vast area of territorial water and an Exclusive Economic Zone (EEZ). Therefore, security challenges and threats have been seen include:

1. Geopolitical uncertainty among great major powers

2. The rising threat of Non-Traditional Security Challenges

3. The complex security dynamics of the Asian neighbourhood

Thus, Royal Malaysian Airforce (RMAF) is an air power component entrusted with safeguarding Malaysia's airspace sovereignty. Therefore, to defend Malaysia's airspace, logistics readiness is one of the key elements in ensuring the success of every mission conducted to safeguard national sovereignty. This article will discuss the logistics readiness element that contributes to the success of Missions, Continuous Training and Military Operations Other Than War (MOOTW) in RMAF.

Key Player For Logistics Readiness

Air Support Command Headquarters (Asc Hq)

Air Support Command Headquarter consist of

Materiel and Engineering officers and airmen led by the Air Support Command Commander. ASC is the main body overseeing the logistic readiness process from the configuration of the aircraft, sustainment programme of the aircraft and radar, and supply chain management, including strategic cooperation among the industry players, contract management, procurement, repair and provisioning of the aircraft spare, special to air equipment and radar.

Base-Level Logistic Readiness

Every RMAF base consists of a Material Branch and an Engineering Branch as a logistic readiness at the base level. It is a part of multiple squadrons/branches such as flying squadrons, air defence squadrons, air traffic branch and administration branch, to generate air power.

Materiel Branch: Materiel specialists play a vital role in maintaining the availability of aircraft spare parts, tools, vehicles and munitions. Their work involves forecasting, procurement and managing repairs at the base level, often under tight timelines.

Engineering Branch: Engineering specialists maintain

and configure the aircraft and radar. Aircraft are the heart of the RMAF's operations, while the radar is the eyes of the sky. Schedule inspections, repairs, and servicing to ensure maximum availability to achieve and support mission requirements.

Logistics Readiness Element

Aircraft/ Radar Spare Management

Aircraft Spare Management is managed by the Flait Bantuan Materiel (FBM), one of the crucial sections embedded in the flying/radar squadron to oversee the supply chain management and ensure the aircraft remains operational and mission-ready. FBM and the engineering section at the squadron level usually work together to ensure the availability of the aircraft and radar. FBM are responsible for providing the aircraft/radar spare parts and reducing the Aircraft on Ground (AOG) or Radar off Air (ROA). As a part of supply chain management, FBM needs to ensure the component repairs are proceeding to either MATRA or Depoh Materiel Utama (DMU).

Provisioning the number of spares for the stock level can prevent overstocking, which ties up the resources, and understocking the minimum level can lead to mission delays and AOG/ROA. Provisioning helps in forecasting the maintenance and preparing for deployments. Spare parts inventory management at the squadron helps to minimise the aircraft's downtime by ensuring the engineering airmen have quick access to the system for critical spares and reducing downtime. A well-managed aircraft spare will ensure the aircraft can be rapidly repaired as a part of logistics readiness and get back to the air for a mission such as an aircraft on alert, force down aircraft mission or air patrol mission.

On the operational level, inventory management plays a significant role in expediting the sources of spare parts either for radar, aircraft or equipment. For example, DMU has been gazetted as a repairing hub for most of the aircraft type components in RMAF. With the good practice of Inventory management, the item will be kept and easily tracked before the shipment is out. The same goes for new receiving components or consumables items; inventory management helps the FBM to track the spare across the system, especially at DMU. The downtime of the aircraft is shortened with the good practice of inventory management. Thus, it contributes to getting the aircraft ready for a mission.

Fuel Readiness

Aircraft without fuel is just a monument. Besides machines and methods to generate effective force, man is one of the factors that support effective force. Fuel specialists in the material branch at the base level play a crucial role in logistics readiness, where air superiority depends on efficient fuel supply and distribution. Fuel is one of the raw materials that are significant factors in achieving mission success. Proper fuel planning and storage, especially in bulk, ensure the aircraft is mission-ready and safe for distribution to other aircraft, such as SU-30MKM 'buddy refuelling' training or Air-to-Air Refuelling mission (AAR) between tanker and other fighter aircraft in the air.

Any disruption in fuel supply will directly affect logistic readiness by delaying response time and reducing combat capabilities in warfighting. Fuels management helps to streamline logistics operations by forecasting fuel demands based on trends in the mission carried out at the base. Besides, to keep the readiness, fuel capacity also needs to be calculated according to the requirement of REDCON 4 as we are moving forward to CAP55. It helps to optimise storage and reduce the dependency on emergency resupply, which can be

costly and time-consuming. A good practice of supply chain minimises the risk of shortage, the lab test conducted during the receiving of the fuels minimises the risk of contamination and enhances the safety of flight operation.

Hence, fuel specialists, as one of the elements of man, machine and method, are mainly important to keep fuel readiness at the best level of operations.

With the expertise, knowledge, and experience, it contributes to the success of the mission and training planned to enhance the people of RMAF, especially flyers. Thus, fuel readiness is one of the logistics readiness so that the aircraft can perform the mission effectively, such as Logistics Communication (LOGCOM), Basic Fighter Manoeuvre (BFM) and Airdrop Missions.

Air Movement Readiness

In civilian world, an airport is a place for aircraft to get the supplies, refuel and pick up the passenger and cargo for the next destination. Hence, the role of an airport in RMAF has been provided by Air Movement Section (AMS). AMS provides a movement hub for the efficient movement of personnel, equipment special to air, cargo and supplies to support military operations, including transiting aircraft, diversion aircraft and Military Operations Other Than War (MOOTW) in RMAF.

AMS works and teams up with air mobility forces such as No 20 Squadron, No 10 Squadron, and No 22 Squadron to play a role in crisis time and peacetime by enhancing sustainment and rapid response. They are responsible for handling cargo and personnel to be transported to the operational area. It supports the force projection by allowing air assets to be deployed in the operation area, such as resupply missions or evacuation of troops for Ops Banding and enrolment of new troops for Ops PASIR. On the other hand, the daily operations of AMS are more focus on delivering goods, such as aircraft spares, domestic items, and passengers. This enhances the priority of the item, needed to be sent as soon as possible.

During the era of COVID-19, AMS played an important role in MOOTW's mission to deliver medical supplies, masks, and vaccines to east peninsular Malaysia. Air mobility in RMAF gives spaces for AMS to operate

interoperability by facilitating logistic coordination with allied forces such as the National Disaster Management Agency (NADMA) and National Security Council (NSC), Bank Negara or other government agencies via a Logistic Communication Mission. Hence, AMS readiness is a key player during peacetime and crisis time to provide air mobility for the efficient movement of cargo and passengers across Malaysia. In addition, it brings up the image of RMAF as a first responder in Air Mobility during crisis and peacetime.

Vehicles Readiness

Vehicle readiness is an element that plays a crucial role in Logistic Readiness in RMAF. Ground transportation assets are reliable for transporting troops, domestic items and spare parts, especially at warehouses such

as DMU to the bases supporting FBM at the squadron. Ground transportation also provides mobility for moving personnel from one place to another. In addition, vehicle readiness also provides the transport service to the national state guests during the visit to Malaysia.

During Air Mobility Tactical Operation Exercises (AMTOP), ground transportation plays a vital role, especially in recovering supplies and paratroopers at the drop zone area and carrying troops for patrolling. Besides the domestic ground vehicles, special vehicles such as refueller, K-loader, forklifts, munitions handling units, and bomb lift trucks are essential to support the supply chain and distribution efficiency to generate effective force. For example, in Exercise PARADISE, the serviceability of the refueller is counted to sustain the Serial of Event (SOE) for 1-day training scenario. Hence, vehicle readiness plays a significant role as it is a chain to complete the entire process of logistic support.

Conclusion

Logistic readiness is a critical enabler of RMAF's ability to sustain air operations, maintain aircraft fleet availability and ensure missions are carried out successfully. In addition, efficient logistic management, including aircraft / radar spare management, fuel supply, Air movement Readiness and vehicle management, are the core factors to ensure operational continuity and rapid response to emerging threats and challenges.

As a Malaysia geostrategic location and evolving security landscape, RMAF should continuously adapt and modernise its logistic capabilities and move forward to achieve a credible and full spectrum air force to enhance force projection, improve supply chain efficiency and strengthen resilience against traditional and non-traditional threats.

Hence, by prioritising logistics readiness, RMAF can reinforce its role in defending national airspace, supporting joint operations and contributing to regional stability. A well-prepared logistic system is not just a support function; it is a force multiplier that directly impacts mission success and overall air power effectiveness.

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PERFORMANCE-BASED CONTRACTING (PBC): A COMPREHENSIVE OVERVIEW IN THE CONTEXT OF THE ROYAL MALAYSIAN AIR FORCE (RMAF)

by MAJ MUSTAKIN BIN JAMAL RMAF

Introduction

Performance-Based Contracting (PBC) is a strategic approach in procurement, emphasizing the outcomes and performance rather than the specific processes involved. This essay explores into the background, history, and development of PBC, particularly within the Royal Malaysian Air Force (RMAF). It also addresses the challenges faced and explores potential future directions for effective implementation.

Background

Ministry of Finance (MoF) have ordered RMAF to embark in Performance Based Contracting in defence procurement since 2015. Contract "Perkhidmatan Senggaraan Radar Pertahanan Udara RAT 31 di Skn 312 Western Hill, Penang" was the first product PBC approach since 2015 until now to maintain the serviceability of RMAF's radar superior at all time. After that follow by maintenance aircraft contract until RMAF reach up to 15 PBC contract nowadays.

Performance-Based Contracting originated as a means to improve efficiency and accountability in government and defence contracting. Unlike traditional contracts, which specify the inputs and processes, PBC focuses on defining the desired outcomes and allowing contractors the flexibility to determine how best to achieve these results. This shift aims to foster innovation, cost-effectiveness, and higher performance standards.

History and Development

The adoption of PBC in military settings has its roots in the late 20th century, driven by the need for better resource management and operational effectiveness. In the context of the RMAF, PBC was gradually integrated into procurement and maintenance strategies to address inefficiencies and enhance mission readiness. In 2015, RMAF learned the idea of PBC from Subject Matter Expert (SME) which is Capability Acquisition and Sustainment Group (CAS-G), Australia before co-operate with Technology Depository Agency (TDA) under MoF.

Development in the Royal Malaysian Air Force

The RMAF has implemented PBC in various areas, including aircraft maintenance, logistics support, and equipment procurement. This transition has involved redefining contract terms to focus on key performance indicators (KPIs) such as aircraft availability, mission-capable rates, and turnaround times. By emphasizing these metrics, the RMAF aims to ensure that service providers are aligned with its operational goals.

One notable example is the implementation of PBC for the maintenance of the Sukhoi Su-30MKM fleet. Contracts were structured to ensure that service providers are incentivized to maintain high aircraft availability rates, directly impacting the RMAF's operational capabilities.

Challenges

Despite its advantages, PBC presents several challenges. Firstly, defining clear and measurable performance outcomes can be complex, particularly for intricate military operations. There is also the risk of contractors prioritizing easily measurable metrics over broader mission objectives. Additionally, effective monitoring and enforcement of PBC agreements require robust oversight mechanisms, which can strain existing administrative capacities.

In the RMAF context, integrating PBC has sometimes been hindered by resistance to change, both within the military hierarchy and among traditional contractors. The need for comprehensive training and a cultural shift towards performance-oriented thinking is essential but can be difficult to achieve.

Way Forward

To overcome these challenges, the RMAF can take several steps. Enhancing training programs to in still a deeper understanding of PBC principles among military personnel and contractors is crucial. Developing more sophisticated and adaptable KPIs that accurately reflect mission success without oversimplifying objectives is another key strategy.

Moreover, leveraging technology for real-time performance monitoring can provide more accurate and timely data, allowing for better contract management and adjustments. Establishing a feedback loop with contractors to continuously refine and improve PBC frameworks will also be beneficial.

Collaboration with other military organizations and learning from international best practices can provide valuable insights. For instance, the experiences of the United States Department of Defence with PBC offer lessons in both successful strategies and potential pitfalls.

Benefits of PBC

The implementation of PBC in the RMAF is expected to bring numerous benefits. One of the primary advantages is improved cost efficiency. By tying payments to performance outcomes, the RMAF ensures that it only pays for results that meet predefined standards, thereby minimizing wasteful expenditures. Additionally, PBC fosters innovation as contractors have the freedom to devise the most effective methods to achieve the desired outcomes.

Another significant benefit is enhanced accountability. With clearly defined performance metrics, both the RMAF and its contractors have a transparent basis for evaluating success. This clarity helps to build trust and ensure that all parties are committed to achieving the contract's objectives. Furthermore, PBC can lead to improved service quality as contractors are motivated to meet and exceed performance targets to secure future contracts.

Case Studies and Examples

Examining specific case studies can provide deeper insights into the practical application and impact of PBC in the RMAF. One such example is the maintenance contract for the RMAF's fleet of C-130 Hercules aircraft with AIROD Sdn Bhd. Under this PBC arrangement, the contractor is responsible for ensuring a high mission-capable rate, with financial incentives tied to the aircraft's availability and performance during missions.

Similarly, the PBC contract for the maintenance of the VVIP aircraft fleet has been structured to ensure high levels of operational readiness. The contractor's performance is measured based on the aircraft's availability for mission deployment and the turnaround time for repairs and maintenance. These contracts have demonstrated tangible improvements in aircraft availability and mission success rates, underscoring the efficacy of PBC in enhancing military capabilities.

Global Perspectives and Best Practices

Learning from global experiences with PBC can offer valuable lessons for the RMAF. The United Kingdom's Ministry of Defence, for example, has successfully implemented PBC in various defence projects. One notable instance is the PBC arrangement for the maintenance of the RAF's Typhoon fighter jets. This contract has significantly improved aircraft availability and reduced maintenance costs through a focus on performance outcomes.

The United States Department of Defence has also extensively utilized PBC, particularly in logistics and supply chain management. The Performance-Based Logistics (PBL) contracts for the U.S. Navy's F/A-18 aircraft have been credited with improving aircraft readiness and reducing life-cycle costs. These international examples highlight the importance of clear performance metrics, robust oversight, and continuous improvement in maximizing the benefits of PBC.

Technology Depository Agency (TDA), Malaysia

The Technology Depository Agency (TDA) in Malaysia plays a pivotal role in promoting and implementing PBC frameworks within the defence sector. Established to facilitate technology transfer and enhance the local defence industry's capabilities, the TDA also oversees the compliance and performance of defence contracts.

The TDA's involvement in PBC includes ensuring that contracts are designed with clear performance metrics and outcomes. By acting as an intermediary between the government and contractors, the TDA helps align the objectives of both parties, ensuring that performance standards are met. The TDA also facilitates the adoption of advanced technologies and best practices from global PBC implementations, thereby improving the overall effectiveness and efficiency of defence contracts in Malaysia.

For instance, in collaboration with the RMAF, the TDA has been instrumental in implementing PBC for the maintenance of various aircraft fleets. By leveraging its expertise in technology management and contract oversight, the TDA ensures that the performance metrics are not only met but also continually improved. This collaboration has resulted in higher aircraft availability and operational readiness, showcasing the successful integration of PBC principles.

Conclusion

Performance-Based Contracting represents a significant shift in procurement and service management, with the potential to greatly enhance the efficiency and effectiveness of military operations. In the Royal Malaysian Air Force, the adoption of PBC has shown promise in improving operational readiness and resource management. However, the transition is fraught with challenges that require a concerted effort to address. By focusing on training, technological integration, and continuous improvement, the RMAF can fully realize the benefits of PBC, ensuring it remains a formidable force in maintaining national security.

The journey towards fully implementing PBC is ongoing, and its success will depend on the ability of the RMAF to adapt and innovate. As the RMAF continues to refine its approach, it can serve as a model for other branches of the military and government agencies seeking to enhance their operational effectiveness through performance-based strategies.

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FLYING INSTRUCTOR COURSE (FIC) A-90 EXPERIENCE
by MAJ MUHAMAD NUR AMIN BIN JAAMAT RMAF

Introduction

Qualified Flying Instructor (QFI), Qualified Tactical Flying Instructor (QTFI), or Instructor Pilot (IP). Those are the achievements that every pilot in the Royal Malaysia Air Force (RMAF) wants to achieve someday in their career. For those RMAF pilots who want to be instructors, they need to undergo the Flying Instructor Course (FIC) either by the local course that is conducted by Institut Latihan Instruktur Terbang (ILIT) or by the overseas course that is conducted by several selected countries, such as Australia, Indonesia, Canada and etc.

Preparation

Local courses and overseas courses are two different things. For local courses, mostly we do not need to worry about what we will encounter in daily life. But for those who are selected to go for the overseas course, it is a different thing. Most of the things were different that needed to be endured and adapted along the course. So, there is so much preparation that needs to settle down before going to the overseas course. Those preparations include domestic, physical, and mental.

For the domestic preparation, things that need to be prepared are local knowledge for the country that you will be going to for the course. About the do's and don'ts throughout the course, about how to adapt in terms of lifestyle, the mental fitness, especially for those who are leaving their family behind back in Malaysia and will be going alone for the course. Lastly for our own physical fitness and health.

For those who selected to go for the overseas course in Indonesia, it seems like everything is doing just fine, but the reality isn't. Yes, Indonesia and Malaysia are neighbouring countries, and these countries can be called "serumpun," yet they're so much different in terms of language, culture, currencies, time zone, food and etc.

For the language, even though we can understand their national language, which is "Bahasa Indonesia", most of the time they speak using their native language. It takes quite some time to understand and to apply their native language in daily routine in order to adapt. They had more than 600 ethnicities, each with their own language and culture. Other than that, in Malaysia had only one time zone, but for Indonesia, it had three different time zones. About the food, gratefully most of the food was halal.

Lesson & Training

Upon arriving at Yogyakarta International Airport (YIA), Indonesia, I was fetched by one of the instructor pilots (IP), whose name is Kapt Pnb Firman, callsign J-991. Actually, he was a former student for FIC in ILIT back in the year 2021. Then I was sent to Mes Wirambara 2, where all the trainees for the Sekolah Instruktur Penerbang (SIP) A-90 will be placed. The course was held nearly 8 months from 3rd March untill 30th October 2025 at Wing Pendidikan Terbang (WingDik) 100, Lanud Adisutjipto, Jogyakarta, Indonesia.

The opening ceremony was held on 5th March 2025 at Gedung Jupiter, which consists of 27 local participants from Tentera Nasional Indonesia-Angkatan Udara (TNI-AU) and 1 overseas course participant (OCP) from TUDM which make the total course participants (CP) are 28. After the opening was completed, it marked the 8-month journey for me to complete the course.

During the first two weeks, it was called a probation period. There were no outings, no overnight stays, nor weekends given for all the CPs due to preparing ourselves for the physical fitness test that will be conducted at the end of the probation period. Those

who pass the physical fitness test will be awarded a leave pass for subsequent weekends throughout the course and also depending on the overall performance of the CPs. Unfortunately, no privileges for those who do not pass or not performing well.

For the daily routine, include the weekend and if we were not allowed for leave, all of us would be woken up at 4.00 am for Subuh prayer at the Al-Haadi Mosque in the Mess compound. Then we continue with a 3 km Morning Run at 5.00 am. For the working days after the Morning Run, at 6.00 am all the CPs will go to the Base by bus and come back to the Mess at 16.00 pm. But mostly, all the CPs were coming back running to the Mess from the Base, which is a 3 km run due to the lack of performance during the Ground School Phase or the Flying Phase. Then at 16.30 pm till 17.30 pm will be the sports for the CPs. At 17.30 pm all the CPs will go to the Al-Haadi Mosque for Magrib prayer and then come back to the Mess for dinner at 18.00 pm. After that, at 18.00 pm till 18.30 pm, all the CPs will be going back to Al-Haadi Mosque for Isyak prayer. The preparation time for all the CPs is from 19.00 pm till 22.00 pm.

During the Ground School Phase, which ran from 5th March to 08th May 2024, was held at Skadron Pendidikan (Skadik) 104. The subjects covered in the Ground School were very similar to those covered in ILIT's FIC. However, the language was different, although "Bahasa Indonesia" is used officially in all of the communication channels here, the local language is spoken most of the time, making it difficult for the OCP to understand. Additionally, every publication was available only in "Bahasa Indonesia".

For the Flying Phase, conducted from 13th May till 20th October 2024, all the CPs were under Skadron Pendidikan (Skadik) 102 using the aircraft named KT-1B Wong Bee manufactured by Korea. During this phase, all CPs were flown every day in order to complete a total of 88 hours of flying, including the On-Type Conversion and the Instructional Conversion. Up to four waves of flying schedules and up to seven sorties per wave were planned daily. For the Flying Training Device (FTD), it was planned accordingly in between the flying schedule.

There is something special during the flying phase, it is the Navigasi Jarak Jauh (NJJ), which is all the CPs need to fly from Lanud Adisutjipto, Jogyakarta to Lanud I Gusti Ngurah Rai, which is located in Bali. And fly back to Lanud Adisutjipto on the next day. The last sortie flown was the CAT D Check, and all the CPs need to pass for the check in order to become the Instructor Pilot. Those who had passed from the SIP would be awarded the IJAZAH together with the Instructor Pilot Wing and the 1st Class Wing of the TNI-AU.

Real Life Support

The Embassy of Malaysia was located in Jakarta and had played an important role during my stay at Lanud Adisutjipto, Yogyakarta. They had helped me much throughout the course. Other than that, the most important were my course mates. Most of the support, either domestic, daily routine, or including morale support, was coming from them all. They were very supportive during my journey to complete the course.

TNI-AU also played their part in order to take care of me throughout my course. Everything was well prepared by the TNI-AU in terms logistics and support. Around the mess compound there were much facilities have been allocated, such as a swimming pool, recreational room, jamming room, TV room, and also the karaoke. For the sport facilities, there also had a multipurpose hall that could be occupied for several sports such as badminton, table tennis, volleyball, sepak takraw, etc.

Social Activities

Prior to the Flying Phase, all the CPs need to undergo Module Percaya Diri, which is conducted by the most experienced motivator in the TNI-AU. It is a two-day event that involves day and night events. During the day event, mostly there were classes, including sharing moments from the instructors. Meanwhile, during the night, there were physical and spiritual activities, which included the Fire Stone Walk. This module was to improve self-confidence and also to develop cooperation among the CPs not only during the course but also as the Instructor Pilot to be.

The spiritual activities, such as Yassin and Tahlil, were conducted at Jupiter Mosque at Lanud Adisutjipto before all the CPs started the Ground School Phase and Flying Phase. Other than that, there was a night that all the IPs and CPs were celebrating together during the Night Flying Phase. It is because the CP had completed half of the course syllabus. During that night, all the IP, CP, and all the supporting staff were gathered to celebrate.

Other than that, when each of the Basic Flying Course students had completed their journey to be an aviator, there was a special ceremony that was conducted by the IP to celebrate their achievement known as "Larian Nol Kilometer". This ceremony starts at 22.00 pm until 08.00 am the next morning. It was a 10 km run, including visiting all the historic memorial places around Yogyakarta Town. All the IPs and trainees will be involved, including the SIP. For SIP, the End of Course celebration was a bit different than the Basic Flying Course. It involves all the CPs, IPs, and all the supporting staff of WingDik 100 Terbang in the event. It was an informal event held inside one of the hangars for Home of The Jupiter.

Summary

20th October 2025, it was the last day that I ever flew the KT-1B Wong Bee for my CAT D Check sortie, and I have completed my journey for SIP A-90. On the 30th of October 2025, it marks the end of the SIP A-90. The closing ceremony was held inside the Jupiter Hall and was attended by the Komandan of Komando Pendidikan dan Latihan Angkatan Udara (Kodiklatau) TNI-AU. All the 28 CPs of SIP A-90 had successfully completed their journey to become the Instructor Pilot. All the CPs will be going back to their own respective Skadron Udara, including myself.

My journey in SIP A-90 had been completed, and it was a great experience for me to be given a chance to attend the overseas course. I was flying back to Malaysia on 4th November 2025 and continuing my tour in the RMAF. It never was not a goodbye for me and I hope that one fine day I will be able to come back to Yogyakarta, again.

ENHANCEMENT OF TECHNICAL PUBLICATION MANAGEMENT AND AIRCRAFT MANUAL MANAGEMENT FOR CN235-220M/VIP/MSA IN RMAF

by WARRANT OFFICER II MUHAMAD AKMAL BIN AFRIZAL

Introduction

Managing technical publications for an aircraft like the CN235 involves organizing, updating, and ensuring that all necessary documentation is accurate and readily available for maintenance, operations, and modifications. These documents are crucial for the safe and efficient operation of the aircraft. Here's an overview of how you might manage technical publications for the CN235:

1. Types of Technical Publications

Aircraft Maintenance Manuals (AMM): Detailed guides covering the maintenance and repair procedures for the CN235.

Service Bulletins (SB): Issued by the manufacturer to inform operators of new updates, modifications, or safety issues related to the aircraft.

Service Letters (SL): Provide additional information or clarifications about specific issues or procedures.

Flight Manual (AFM): Details operational limits, flight procedures, and handling.

Parts Catalog (IPC): Provides a list of all components and parts used in the CN235, including part numbers and specifications.

Wiring Diagrams and Schematics: Essential for troubleshooting electrical systems.

Component Maintenance Manuals (CMM): Specific to the maintenance of components like engines, avionics, landing gear, etc.

2. Document Control

Version Control: Ensure that all documents are regularly updated, with version control processes in place to track changes and revisions. For instance, any new procedures or modifications based on regulatory changes or manufacturer updates should be captured and circulated.

Standardization: All documents should follow the standard formatting and naming conventions to ensure consistency across all manuals.

Access Control: Make sure that all relevant personnel, such as maintenance engineers, pilots, and technical staff, have access to the latest documents. This can be done via a secure online portal or a digital document management system.

3. Document Distribution

Digitalization: Many aircraft manufacturers and operators prefer digital formats (PDF, XML, etc.) for easier distribution and updates. An electronic library can be created where all publications are stored and updated in real time.

Offline Access: For areas with limited internet access, offline solutions like CDs, DVDs, or USB drives might be used.

Subscription Service: Service providers can offer a subscription model to regularly send updates or new publications.

4. Compliance with Regulatory Bodies

Civil Aviation Authorities (CAA): Ensure that all documents comply with the regulations of the relevant aviation authorities (e.g., EASA, FAA). This includes updates to airworthiness directives (ADs), safety regulations, and certification requirements.

Internal Audits: Periodic checks and audits should be conducted to ensure that the CN235's technical publications are compliant with the current regulations and operational needs.

5. Training and Support

Staff Training: Personnel responsible for maintaining and operating the CN235 should be trained on how to access, interpret, and apply the technical publications.

Feedback Mechanism: Create a system where feedback from the maintenance teams can be sent back to the

publication management team for improvements or clarification on any technical publications.

6. Software and Tools

Content Management Systems (CMS): A robust CMS can help organize, update, and track the versions of all technical documents.

Electronic Flight Bags (EFBs): Aircraft operators can implement EFBs to store and access the publications, ensuring that pilots and crew have up-to-date manuals at their fingertips.

Maintenance Management Systems (MMS): These systems are often integrated with technical publications to ensure that maintenance teams have direct access to manuals while scheduling and performing tasks.

7. Change Management

Scheduled Updates: Implement a process for periodic reviews and updates of technical publications based on new regulations, design changes, or aircraft modifications.

Modification Tracking: When modifications or upgrades are performed on the CN235, these should be documented thoroughly in the technical publications, ensuring the aircraft continues to meet operational standards.

Course Background

Enhancement of Technical Publication Management and Aircraft Manual Management for CN235-220 M/VIP/MSA course was a course conducted by RMAF and PT Dirgantara Indonesia under Industry Collaboration Program (ICP).

This course were conducted at the PTDI Training Center located at Bandung, Indonesia from 13 May 24 until 28 May 24.This course was managed by Customer Support Division of PTDI.

In this course, participant will learn and gained knowledge about all publication related to aircraft CN 235-220 and the process of the publication have been created at their facilities.

Course Experiences

Upon arrival at the Soekarno Hatta International Airport, Jakarta after 1 hour and 45 minutes flight, I was picked up by PTDI personnel and taken to my accomodation which was 3 hours journey from Jakarta to the city of Bandung, West Java.

After arrived at my accomodation in Bandung, I and my other two participants were briefed on 'Do' and 'Dont's' about the basic environment, social culture and way of life in Indonesia. After being briefed, we also being taken to the Training Facility which was located near the TNI-AU Husein Sastranegara airbase for familiarization.

On the first day before the class session started, we were taken on a tour of the classroom and others facilities. After that,we were required to complete all the administrative requirements such as registration identification of the foreign military students.

This course is a two weeks course that is often held in three participants to ensure the quality of the training delivered in theory and practical session.This class session starts at 0800 hours and ended at 1600 hours.There are total of eight instructors from PTDI training department involved on this course.

This course were divided into two phases, the theoretical phase and the practical phase. The theoretical phase was about learning various type of publication related to the aircraft CN235-220. All course participants will attend an exam or quiz before the class session ended every day.

CN235-220M / VIP / MSA Manuals

Aircraft Manuals is engineering documents that contain operation, maintenance and misscelanous of an aircraft which is published at the same time as delivery of the aircraft. Aircraft Manuals divided into two categories which is Basic Manuals and Additional Manuals.

Basic Manuals divided into two type of manual which is Operation Manuals and Maintenance Manuals.

1. Operation Manuals
   a) Aircraft Flight Manuals (AFM)
   b) Aircraft Operation Manuals (AOM)
   c) Quick Reference handling Manual (QRH)
   d) Master minimum Equoment List (MMEL)
2. Maintenance Manuals
   a) Maintenace Inspection/ Check (AMM Ch. 05)
   b) Structure Repair Manual (SRM)
   c) Non – Destructive Test Manual (NDTM)
   d) llustrated Tool and Equipment Manual (ITEM)

e) Weight and Balance manual (WBM)

f) List of Consumable Manual (LCM)

g) Service Letter & index (SL)

h) Service Bulletin & Index (SB)

i) Component Maintenance Manual & Index (CMM)

j) List of Applicale Publication (LOAP)

Additional Manuals

1. Cargo Loading Manual (CLM)

2. Aircraft Recovery Manual (ARM)

3. Corrosion Prevention & Control Program (CPCP)

4. Corrosion Prevention Manual (CPM)

5. Maintenance Task Analysis (MTA)

6. Aircraft Wire List (AWL)

7. Technical Publication User Guide (TPUG)

8. Pre- Flight and Post Flight Inspection (PP)

9. Work Code Unit Manual (WUCM)

10. Progressive maintenance Manual (PMM)

11. Nato Stock Number (NSN)

12. Aircraft Handling & Facility Manual (AHFM)

Regulation and Standardization

To get certification of an Aircraft (CN235), it has to be done according to the Federation Aviation Regulation (FAR) Part 25, which is equivalent with Joint Aviation Regulation (JAR) Part 25 in Europe.

According to the FAR Part 25.1529, the Aircraft Manufacturer must provide the Instruction for Continued Airworthiness (ICA) to guarantee that its product (Aircraft) would be safe and airworthy during operation.

The ICA is provided to the operator with all information necessary for the safe operation and maintenance of its aircraft. The ICA for each aircraft should include ICA for the engine and the propeller (herein after designated the aircraft product).

The standardization of the manuals presentation must be compliance with the World Airliners Supplier Guide (WASG) such as :

1. Air Transport Association of America (ATA-100)

2. Military Specification

3. Aircraft European Contractors Manufacturers Association (AECMA Specification 1000 D)

4. Technical Publication use the ATA – 100 and Military Specification for standardization in manuals presentation, including the formatting and chapter numbering

Technical Publication Related To ICA

The Instruction for Continued Airworthiness for each for each airplane must include the Instruction for Continued Airwothiness for each engine and propeller (herein after designated 'products'), for each appliance required by this chapter, and any required information relating to the interface of those appliances and products with the airplane. If ICA are not supplied by the manufacturer of an appliance or product installed in the airplane, the ICA for the airplane must include the information essential to the continued airworthiness of the airplane.

The applicant must submit to the Authority a program to show how changes to the ICA made by the applicant or by the manufacturers or products and appliances installed in the airplane will be distributed.

Basic Regulation related to the Instruction for Continued Airworthiness included:

1. CASR/ FAR/ CS Part 21.50

2. FAA Order 8110.54, Instruction For Continued Airworthiness, Responsibilities, Requirements and Contents.

3. AC25.1529 1A, Instruction For Continued Airworthiness Of Structural Repairs On Transport Airplanes.

4. CASR 25.1529 ICA

For Aircraft (Fixed Wing) :

    1. CASR/ FAR/ CS Part 23.1529 (Appendix H)

    2. CASR/ FAR/ CS Part 25.1529 (Appendix G)

For Rotorcraft (Rotary Wing)

    1. CASR/ FAR/ CS Part 27.1529 (Appendix A)

    2. CASR/ FAR/ CS Part 29.1529 (Appendix A)

The applicant must prepare ICA in accordance with Appendix H to this part that are acceptable to the Director General. The instructions may be incomplete at type certification if a program exists to ensure their completion prior to delivery of the first airplane or issurance of a standard certificate of airworthiness, whichever occurs later.

Technical Publication Bussiness Rule

Since the aircraft manuals have been initially delivered to the customer, all manuals must be evaluated due to changes which may come behind. The changes will be issued in the revision stages. The reason for manual revision:

    1. Data cut – off date (occurs in initial stage of production)

    2. Finding due to differences between as designated and as built

    3. Service Bulletin (SB) proposed.

    4. Alternative Parts (PnP Parts)

    5. Obsolesces (main component)

    6. Major refurbishment – on customer request

    7. Improvement on presentation and content

Manual temporary revision required when data required is considered urgent to issue either correction, addition or new release and not in schedule of normal manual revision. The Temporary revision is presented in format of temporary revision and yellow pages.The The temporary revision is removed when it is turned into normal revision.

Conclusion

Two weeks of interesting experiences course was a meaningful for me and other two participants.We were awarded the certificates and souvenirs from the PTDI. As the Royal Malaysian Airforce (RMAF) member, I ama very grateful for this opportunity and proud that I successfully completed this course. For the RMAF, the knowledge gained from this course will be an opportunity to the shape and develop the future of the RMAF technical publication division.

AUTOGRAF

KUASA UDARA, PERISAI KEDAULATAN NEGARA
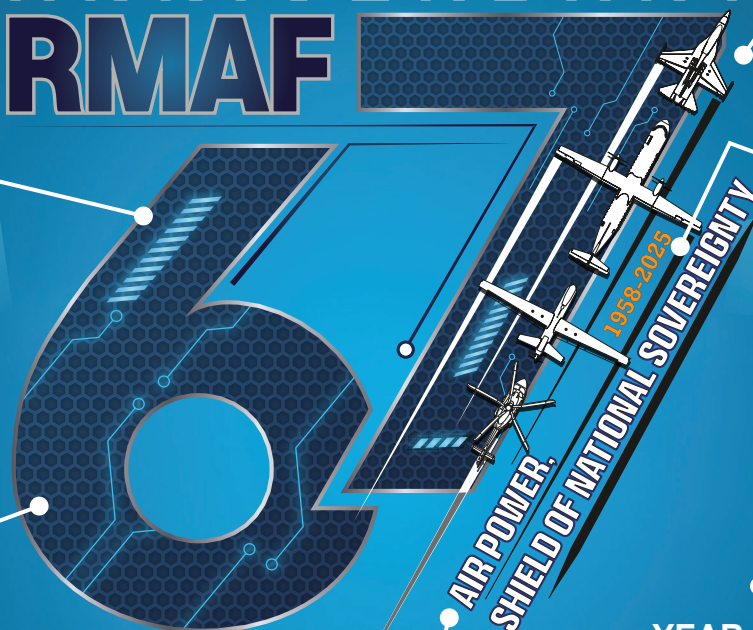## AIR POWER, SHIELD OF NATIONAL SOVEREIGNTY

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NUMBER 67
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