The Future of Singapore's Ground-Based Air Defense

by **LTC Ong Tiong Boon**, **MAJ Joseph Peh** and **CPT Daxson Yap**

Abstract:

Understanding Singapore's strategic situation leads to a realization that air superiority and the presence of a robust air defense are vital for our survival in war. These imperatives drive our investments in air defense capabilities. To deal with the strategic need for a robust air defense system amidst an expanded spectrum of air threats, the Republic of Singapore Air Force (RSAF) must undergo a paradigm shift in our Ground-Based Air Defense (GBAD) operations. This article aims to outline the strategic relevance of air defense capabilities, examine the future threat landscape and capability gaps, and identify the challenges in developing a robust GBAD system for Singapore.

Keywords: Airpower; GBAD; RSAF

INTRODUCTION

Contemporary conflicts around the world have brought Ground-Based Air Defense (GBAD) capabilities into mainstream military discourse. North Korea's testing of long range missiles, Iran's pursuit of nuclear weapons and the asymmetric use of rockets in the Middle East exemplify this trend. Even as offensive capabilities, represented by strike aircraft, Unmanned Aerial Vehicles (UAV) or even cyber attacks, continue to capture the public imagination, defensive capabilities against this expanding spectrum of airborne threats are seen by political and military decision-makers as increasingly relevant.

As we examine the strategic context of Singapore and the expanded spectrum of aerial threats, it is clear that these air defense systems continue to be critical for our defense. Singapore is a very small country with no geographic depth. Cheap and easily available munitions can be launched on our key installations from within neighboring territories with

Advanced weaponry like the Aster surface-to-air missile allows the Formidable-class stealth frigates to provide effective air defense over a large area.

almost no warning. The Republic of Singapore Air Force (RSAF) must provide vigilant and robust island air defense, 24 hours a day, seven days a week, to ensure the sovereignty of our territorial air-space.[1] The mission of air defense is therefore central to the overall mission of the RSAF and indeed the Singapore Armed Forces (SAF) as a whole.

This article aims to outline the strategic relevance of air defense capabilities, examine the future threat landscape and capability gaps, and identify the challenges in developing a robust GBAD system for Singapore.

WHY AIR DEFENSE?

In the history of military conflict, modern warfare is probably best characterized by the introduction of the aerial dimension. Attacks from the air can surprise, overwhelm, and destroy ground forces in a way that surface operations cannot. Therefore, the ability to control the aerial domain quickly became a crucial ingredient for victory. Denial of key terrain, in this case the air, through a network of air defense systems, became an important strategic aim. Singapore's geography means that we have no depth with which to absorb a surprise attack, nor warning time in which to mobilize our defenses. More than most other countries, Singapore requires a constant and persistent air defense.

Attacks from the air can surprise, overwhelm, and destroy ground forces in a way that surface operations cannot. Therefore, the ability to control the aerial domain quickly became a crucial ingredient for victory.

History has also proven the importance of air defense. The Israeli parry of the Syrian air offensive in June 1982 showed that a sound and well-organized air defense can inflict high losses on the enemy and go a long way towards achieving air superiority. The more recent deployment of the Iron Dome system by the Israel Defense Force (IDF) in Operation Pillar of Defense also demonstrated the strategic utility of such a capability.[2] Other geopolitical hotspots such as the Korean Peninsula and Iran further underscore the necessity of air defense.

THE THREAT LANDSCAPE

Understanding Singapore's strategic situation leads to a realization that air superiority and the presence of a robust air defense are vital for our survival in war. These imperatives drive our investments in air defense capabilities. We must be able to detect threats at great distances and marshal firepower to engage those threats in order to safeguard our security. There is urgency in this effort as the threat spectrum has widened greatly in the past two decades—not only have the capabilities and precision of munitions increased, but also their prevalence across the peace-to-war continuum.

Peace and Troubled Peace

Following the events of 9/11, it has become clear that we cannot afford to discount peacetime air threats. The possibility of a hijacked airliner or even light aircraft being used to attack our population centers would certainly result in high civilian casualties and severe damage to critical infrastructure. In addition, many terror groups are also able to easily obtain man-portable surface-to-air missiles (SAMs) and improvised rockets and mortars which can disrupt civil air traffic and threaten our civilian population. During a period of troubled peace, these threats can also arise from asymmetric tactics taken by adversary states.

Wartime

Militaries in the Asia Pacific are modernizing steadily against a backdrop of healthy economic growth. Coupled with the commoditization of

Air Defence Artillery operators checking the alignment of the I-Hawk missiles during loading.

technology and the shrinking European defense market, the access to advanced weapon platforms by regional militaries is expected to increase. Given the quick procurement cycle for advanced munitions in particular, the RSAF must be cognizant of the potential range of air threats in a conventional war scenario. These include (1) traditional airborne threats such as fighters, UAVs and the advanced munitions they carry, (2) Rocket, Artillery and Mortar (RAM) threats, and (3) potentially, stand-off threats such as tactical ballistic missiles or cruise missiles.

Aircraft Threats. We are likely to face more aircraft of better quality and fitted with more advanced weaponry in future. The increasing competition in the global defense market means that most sales today and tomorrow will be bundled with advanced air-to-air and air-to-ground weapons such as Standoff Land Attack Missiles (SLAM), Joint Standoff Weapons (JSOW) and Joint Direct Attack Munitions (JDAM). Many of these are capable of attacks from long range—outside the effective range of our own GBAD systems. In addition, unmanned aerial vehicles will become increasingly affordable, initially in surveillance and intelligence-gathering capacities, but possibly graduating to strike roles in the future.

RAM Threats. RAM systems are inexpensive and readily available weapons, pose a disproportionate danger to Singapore due to our small size and high density. These systems can deliver an overwhelming volume of fire that will severely hamper our ability to generate combat power to defend our sovereignty. Their mobility also makes them difficult to find and destroy at the source.

Stand-off Threats. Tactical Ballistic Missiles (TBM) and Cruise Missiles (CM) are increasingly accessible technologies. While there is no evidence that these capabilities have been introduced in the

region, these missiles could be procured rapidly and potentially pose a significant threat to Singapore. They are difficult to intercept even with state-of-the-art technology, and could be a relatively cheap and quick asymmetric counter against a large conventional fighter aircraft fleet.

RETHINKING SINGAPORE'S AIR DEFENSE

The RSAF regards air defense as one of the highest priority missions. Without an air defense that can protect Singapore from a debilitating surprise attack, there will be no air campaign to speak of. To achieve a robust and formidable defense system, a multi-layered air defense system was designed. It is a carefully calibrated model, comprising an array of sensors, shooters and command and control (C2) systems. These elements are networked to provide enhanced air situation picture and allow fast and effective responses to attrite aerial threats. Should the adversaries leak through the multi-layered air defense, our passive defense measures, such as camouflage and concealment technologies, will further reduce the effectiveness of the residual strikes.

The future of Singapore's air defense systems must be anchored on the principles of sustainability from peace-to-war and effectiveness against the full spectrum of threats. This is of particular importance in view of the future resource constraints in manpower, land and budget.

However, against today's threat environment and the emergence of new technologies, there is a need for a paradigm shift in our air defense capabilities. Our current air defense systems will find it challenging to meet the expanded spectrum of aerial threats that include a complex mix of aircraft and munitions by state and non-state actors. While some of the existing air defense systems remain effective, new capabilities will be required to address the expanded threat spectrum. Our airborne fighters will continue to be required for anti-aircraft operations, but there is also a pressing need to induct new GBAD systems, capable of both anti-aircraft and anti-munitions functions, to protect our key national installations and preserve our ability to generate combat power.

Air Defense Concepts of Other Established Militaries

To meet Singapore's unique operational and resource challenges, we can look to other advanced militaries for possible capability development trajectories and operational concepts. For instance, the United States (US) has rekindled efforts in developing the Theatre Missile Defense (TMD). The TMD, intended to protect the US and its allies from missiles threats, comprises three layers of defense. The first layer is known as the boost-phase defense that targets missiles during the powered phase of their flights. The upper-tier defense is the second layer of defense that is designed against missiles high in the atmosphere. The lower-tier defense forms last defense line against aircraft as well as missiles travelling low in the atmosphere. The TMD has demonstrated to be a capable system with 56 successful hit-to-kill intercepts in 71 missile defense flight tests since 2001.[3]

HARNESSING NEW CAPABILITIES

The combination of an expanded threat spectrum, a lack of geographical depth, and high population density means that Singapore's air defense systems must continue to provide overlapping, multi-tiered protection against the entire range of air threats. However, this must be tempered with an understanding of our unique constraints. The future of Singapore's air defense systems must be anchored on the principles

The crew onboard RSS Stalwart's Combat Information Centre (CIC) monitoring the contacts on the radar screen.

of sustainability from peace-to-war and effectiveness against the full spectrum of threats. This is of particular importance in view of the future resource constraints in manpower, land and budget.

The RSAF fighters remain the backbone of our anti-aircraft operations and the vanguard of our multi-layered air defense system. To maintain this edge, they will need to keep pace with technological advances through weapons and avionics upgrades. However, to reduce our vulnerabilities to new threats, there is a pressing need to equip the RSAF with new GBAD systems, capable of guarding against these threats at various ranges.

Medium to Long-Range Capabilities

The importance of medium to long-range GBAD is demonstrated by the successful employment of the Raytheon MIM-104 Patriot in many combat scenarios.[4] It is developed primarily for the use of the US Army to defend against aircraft and most munitions threats at 70km, as well as ballistic missiles albeit with a shorter range of 20km. Currently, software upgrades to the Patriot are continuing and will allow the Patriot to detect, track, and intercept various kinds of missiles.[5] Despite having been in service for nearly 20 years, its proven track record will make it a key contender for the medium to long-range weapon system of the RSAF's future GBAD systems.

Another candidate is the MBDA Missile Systems and Thales Aster-30 SAMP/T.[6] It is a land-based air defense system effective against high-speed threats ranging from missiles to combat aircraft and UAVs. The SAMP/T systems in French service have been operational since 2010, but have yet to be tested in combat. Nonetheless, its range makes it a potential candidate for our future medium to long-range GBAD systems.

Short-Range Capabilities

The air defense system is incomplete with merely the medium to long-range GBAD weapons. As they are specially designed for medium to long-range interceptions, these GBAD systems are generally inaccurate in the initial boost phase of up to 20km and thus using these systems to engage low-level threats over Singapore can endanger the populace. Furthermore, the higher price-per-shot of such medium to long-range missiles means that these systems are not cost-efficient for use against shorter-range threats such as helicopters and UAVs.

With these considerations in mind, the medium to long-range GBAD weapons must be complemented with a suite of short-range weapons that are capable against both aircraft and munitions threats. The RSAF has already taken delivery of the short-range PYTHON and DERBY (SPYDER) Air Defense system to replace the Rapier system.[8] The SPYDER system has demonstrated effective against conventional and unmanned aircraft, and against missile threats with low radar cross-section (RCS).[9] It fires two different missiles that have proven track records—the Python-5 that is guided by electro-optical/infrared (EO/IR) sensors,[10] and the Derby that has an active radar seeker.[11] These provide the operator with the flexibility of missile choice depending on weather conditions. With an interception range of 15km, batteries of SPYDER systems can be deployed to provide overlapping low-level air defense coverage

and serve as a perfect complement for the medium to long-range systems.

There are also other developments that parallel the capabilities of the SPYDER. Most notable are the Raytheon's Surface-Launched Advanced Medium Range Air-to-Air Missile (SL-AMRAAM),[12] and the Norwegian Advanced Surface to Air Missile System 2 (NASAMS 2).[13] Both these systems fire the AIM-120 AMRAAM and are as capable as the SPYDER. These systems can also be considered in our future platform renewal plans.

Very Short Range Air Defense (v-SHORAD) Capabilities

Even as the significance of short, medium and long-range GBAD systems grow in prominence, v-SHORAD systems, such as the RSAF's RBS-70 and Mistral, are still relevant and important for providing the last-mile defense against aircraft. There have been several key developments for v-SHORAD systems in the past few years. Since 2011, Saab and Bofors have been developing the RBS70 New Generation (RBS70 NG), which will be equipped with improved sighting system that facilitates visual acquisition and identification, even in low visibility conditions. Concurrently, the development of v-SHORAD systems with "4th Generation" infrared (IR) sensors is also underway. For example, Raytheon's new Stinger Block 2 missiles are designed to incorporate advanced guidance and sensor systems to improve performance. These are potential candidates for our future v-SHORAD systems.

Anti-RAM Capabilities

Most GBAD systems worldwide are still ill-equipped to deal with RAM threats. Their flight trajectories are ballistic in nature and their time-to-target is usually measured in seconds rather than minutes. As such, current conventional GBAD weapons are not designed to intercept RAMs. While the need to provide comprehensive protection against RAM threats is a long-standing requirement, the capability to do so has eluded most advanced militaries for many years due to high costs of production and operation, and poor anticipated results on the battlefield.[14]

Only recently have anti-RAM capabilities returned to the spotlight, including the Mobile Land-Based Phalanx Weapon System (MLPWS),[15] Raytheon Centurion Guns,[16] and Oerlikon Skyshield C-RAM System.[17] A more recent success case is the employment of the Iron Dome interceptor system to protect Israel from short range artillery and rockets launched by Hezbollah and Hamas. During Operation Pillar of Defense in November 2012, the Iron Dome was deployed to protect several major Israeli cities, including Tel Aviv and Beersheva. In total, Iron Dome made 421 interceptions,[18] with an estimated success rate of 85%.[19]

With the disproportionate effects that such easily-available RAM systems can have on Singapore, it is vital that our future GBAD systems be equipped with anti-RAM capabilities. The RSAF must consider suitable acquisitions to provide protection for our critical SAF installations and civilian infrastructure against RAM threats.

The key challenge in the future will be to ensure that the suite of sensors and shooters that constitute our future GBAD capabilities is supported by a robust Command, Control, Communications, Computer, and Information network.

FUTURE CHALLENGES

Our strategic constraints, operational challenges and capability gaps point to the characteristics that our future GBAD capabilities must possess: effectiveness against the full spectrum of threats with remaining responsive across the peace-to-war continuum. The key challenge in the future will be

to ensure that the suite of sensors and shooters that constitute our future GBAD capabilities is supported by a robust Command, Control, Communications, Computer, and Information (C4I) network. The concept of Cooperative Engagement Capability (CEC),[20] which advocates the principles of composite surveillance and tracking, and precision cueing followed by coordinated, cooperative engagements, is particularly important for Singapore. However, building an integrated suite of ground-based air defense systems is not a simple undertaking, given our geography and resource constraints. There are a number of challenges that we must overcome.

Airspace Management and Fratricide Prevention

Due to Singapore's lack of geographical depth, the airspace available for operations is extremely limited. As such, all surface-to-air missile engagements must be carefully coordinated with the operations of other airborne assets. To enable that, a high-fidelity composite air surveillance picture must be formed that can process and distinguish the high volume of aircraft and munitions tracks. This requires high-bandwidth connections between the sensors and the central C2 node. Moreover, this composite picture must also be sent to shooters that are dispersed geographically across the area of operations so that tactical coordination can be made to manage the congested airspace and prevent fratricide.

Threats-to-Weapons Matching

As our shooters are optimized for specific threats, it is imperative to ensure accurate and expeditious identification of air threats to allow successful interception. To achieve this, the composite air surveillance picture must also be capable of detailing the characteristics of a threat such as its launch point, predicted impact point and velocity. These are critical in providing clues to its identity and allow the Combat Management Systems to assign the best shooter against the threat. Also, given the short OODA loop required in engaging missile and RAM threats, the C2 network must be highly responsive. The central C2 node must be able to effect close control by providing weapons-cueing information through the CEC network directly to the shooters.

Collateral Damage

Singapore is one of the most densely populated countries in the world. Hazardous installations, such as Senoko Power Plant and the chemical plants on Jurong Island, are close to populated areas. The CEC must assign shooters that can launch and engage the threat at a safe distance from these installations or the populace. Unfortunately, most long-range GBAD systems have boosters that may jettison over populated areas and cause collateral damage. These are challenges that Singapore's future GBAD system will need to address.

CONCLUSION

To deal with the strategic need for a robust air defense system amidst an expanded spectrum of air threats, the RSAF must undergo a paradigm shift in our GBAD operations. The capability gaps identified point to clear trends in a widening spectrum of threats and a pressing need to build a sustainable force across the peace-to-war continuum. This will require the RSAF to overcome a number of challenges unique to our geography and operational environment, in order to continue safeguarding the peace and security of Singapore.

BIBLIOGRAPHY

"Aster 30 SAMP/T – Surface-to-Air Missile Platform/Terrain." *Army Technology*. http://www.army-technology.com/projects/aster-30/.

"SPYDER Surface-to-Air Launcher for PYthon 5 and DERby Missiles, Israel." *Army Technology*. http://www.army-technology.com/projects/spyder/.

"Surface-Launched AMRAAM (SL-AMRAAM/CLAWS), United States of America." *Army Technology*. http://www.army-technology.com/projects/surface-launched/.

"SKYGUARD: Laser Based Counter MANPADS/C-RAM System." Northrop Grumman. *Defense Update*, 2006. http://defense-update.com/products/s/skyguard-laser.htm.

"Raytheon's Mobile Land-Based Phalanx Weapon System Completes Live-Fire Demonstration." *Raytheon Company*, 2 December 2010. http://raytheon.mediaroom.com/index.php? s=43&item=1715.

"Iron Dome: Israel Deploys Unique, Controversial Missile System." Stuart Fox. *NBC News*, 30 March 2011. http://www.nbcnews.com/id/42348984/ns/technology_and_science-science/t/iron-dome-israel-deploys-unique-controversial-missile-system/#.USjf-eiybhF.

"Patriot Theatre Missile Defense." *GlobalSecurity.Org*, 21 July 11. http://www.globalsecurity.org/space/systems/patriot-gem.htm.

"Pillar of Defense Ends in Ceasefire." *Israel Air Force*. http://www.iaf.org.il/4388-39969-en/IAF.aspx.

"Operation Pillar of Defense: Summary of Events." *Israel Defense Forces*, 22 November 2012. http://www.idfblog.com/2012/11/22/operation-pillar-of-defense-summary-of-events/.

"The Cooperative Engagement Capability." *John Hopkins APL Technical Digest* 16, no. 4 (1995). http://www.techdigest.jhuapl.edu/td/td1604/APLteam.pdf.

Katz, Yaakov. "Iron Dome Successfully Intercepts Kassam, Katyusha Barrages." *The Jerusalem Post*, 15 July 2010, 2.

"NASAMS – The Network Centric Air Defense System." *Kongsberg Defense Systems*. http://www.kongsberg.com/en/kds/products/groundbasedairdefensesystems/nasams/.

"Speech by Minister for Defense Teo Chee Hean, at the Inauguration of the Air Defense and Operations Command." *MINDEF*, 2007. http://www.mindef.gov.sg/imindef/press_room/official_releases/nr/2007/jan/05jan07_nr/05jan07_speech.html#.UfW7ktlmX3U.

"Combat Systems of the Frigate." *MINDEF*. http://www.mindef.gov.sg/weapons/ frigate/combatsystems.asp.

"No Escape from the SPYDER." *Cyberpioneer*, 11 June 2011. http://www.mindef.gov.sg/imindef/publications/cyberpioneer/weapon/2011/jun11_weapon.html.

Andreas Parsch. "Raytheon MIM-104 Patriot." *Directory of US Military Rockets and Missiles*, 2002. http://www.designation-systems.net/ dusrm/m-104.html.

"Python-5: Full Sphere IR Air-to-Air or Surface-to-Air Missile." *Rafael Advanced Defense Systems*. http://www.rafael.co.il/marketing/SIP_STORAGE/FILES/9/1189.pdf.

"DERBY: Beyond Visual Range Air-to-Air Missile." *Rafael Advanced Defense Systems*. http://www.rafael.co.il/Marketing/331-887-en/Marketing.aspx.

"Raytheon's Centurion System." *Raytheon Company*. http://www.raytheon.com/capabilities/ products/centurion/.

"Oerlikon Skyshield MOOTW/C-RAM System." *Rheinmetall Defense*. http://www.rheinmetall-defense.com/de/rheinmetall_defense/public_relations/news/detail_1602.php.

"Watching Israel's Missile Defense." *CNN*, 20 November 2012. http://security.blogs.cnn.com/2012/11/20/watching-israels-missile-defense/.

"Vilnai: Israel has Strategic Reason Not to Use Iron Dome." *The Jerusalem Post*, 24 March 2011. www.jpost.com/Defense/Article.aspx?id=213580&pagename=JPost/JPArticle/ ShowFull.

William J. Broad. "US and Israel Shelved Laser as a Defense." *The New York Times*, 30 July 2006. http://www.nytimes.com/2006/07/30/world/middleeast/30laser.html?_r=0

ENDNOTES

1. Speech by Minister for Defense Teo Chee Hean at the Inauguration of the Air Defense and Operations Command, 5 January 2007, http://www.mindef.gov.sg/imindef/press_room/official_releases/nr/2007/jan/05jan07_nr/05jan07_speech.html#.UfW7ktlmX3U.
2. Israel suffered a very low number of casualties over the duration of the campaign: "five Israeli civilians were killed due to rocket fire, while an additional 240 Israeli civilians were injured. In addition, CPL Yosef Fartuk, 18, from Emmanuel, was killed on November 20 by a rocket fired from Gaza into Israel." See "Operation Pillar of Defense: Summary of Events," *IDF Blog*, 22 November 2012, http://www.idfblog.com/2012/11/22/operation-pillar-of-defense-summary-of-events/.
3. "US Missile Defenses Undergo Complex Test," *Examiner*, http://www.examiner.com/article/u-s-conducts-largest-most-complex-missile-defense-flight-test-ever.

4. "Raytheon MIM-104 Patriot," *Designation Systems*, 3 December 2002, http://www.designation-systems.net/dusrm/m-104.html.

5. "Patriot Theatre Missile Defense," *GlobalSecurity.org*, 11 February 2013, http://www.globalsecurity.org/space/systems/patriot-gem.htm.

6. "Aster 30 SAMP/T – Surface-to-Air Missile Platform/Terrain," *Army Technology*, 9 February 2013, http://www.army-technology.com/projects/aster-30/.

7. The acquisition of the Aster-30 surface-to-air missile system was announced by Minister for Defense Dr Ng Eng Hn in Parliament on 16 September 2013.

8. Ong Hong Tat, "No escape from the SPYDER," *MINDEF*, 17 June 2011, http://www.mindef.gov.sg/imindef/publications/cyberpioneer/weapon/2011/jun11_weapon.html.

9. "SPYDER Surface-to-Air Launcher for PYthon 5 and DERby Missiles, Israel," *Army Technology*, 9 February 2013. http://www.army-technology.com/projects/spyder.

10. "Python-5: Full Sphere IR Air-to-Air or Surface-to-Air Missile," *Rafael*, 23 February 2013, http://www.rafael.co.il/marketing/SIP_STORAGE/FILES/9/1189.pdf.

11. "DERBY: Beyond Visual Range Air-to-Air Missile," *Rafael*, 23 February 2013, http://www.rafael.co.il/Marketing/331-887-en/Marketing.aspx.

12. "Surface-Launched AMRAAM (SL-AMRAAM/CLAWS), United States of America," *Army Technology*, 10 February 2013, http://www.army-technology.com/projects/surface-launched /.

13. "NASAMS – The Network Centric Air Defense System," *KONGSBERG*, 10 February 2013, http://www.kongsberg.com/en/kds/products/groundbasedairdefensesystems/nasams/.

14. William J. Broad, "US and Israel Shelved Laser as a Defense," *The New York Times*, 30 July 2006, http://www.nytimes.com/2006/07/30/world/middleeast/30laser.html?_r=0.

15. "Raytheon's Mobile Land-Based Phalanx Weapon System Completes Live-Fire Demonstration," *Raytheon*, 2 December 2010, http://raytheon.mediaroom.com/index.php?s=43&item=1715.

16. "Raytheon's Centurion System," *Raytheon*, 11 February 2013, http://www.raytheon.com/capabilities/products/centurion/.

17. "Oerlikon Skyshield MOOTW/C-RAM System," *Rheinmetall Defense*, 21 September 2010, http://www.rheinmetall-defense.com/de/rheinmetall_defense/public_relations/news/detail_1602.php.

18. "Pillar of Defense Ends in Ceasefire," *IAF Website*, 21 November 2012,http://www.iaf.org.il/4388-39969-en/IAF.aspx.

19. "Watching Israel's Missile Defense," *CNN*, 20 November 2012, http://security.blogs.cnn.com/2012/11/20/watching-israels-missile-defense/.

20. "The Cooperative Engagement Capability," *John Hopkins APL Team*, 24 February 2013, http://techdigest.jhuapl.edu/td/td1604/APLteam.pdf.

LTC Ong Tiong Boon is an F-5 pilot and currently the Commanding Officer of the Tactical Air Command Post Squadron. LTC Ong is a recipient of the SAF Military Training Award. He holds a Bachelors in Aeronautical Engineering (First Class Honors) from the Australian Defence Force Academy.

MAJ Joseph Peh is currently the Commanding Officer of 165 SQN. He is an Air Warfare Officer (GBAD) by vocation and was previously a Branch Head in Air Manpower Dept, an Officer Commanding in 160 SQN, and a Deputy Branch Head in Air Plans Dept. He holds a Master of Engineering (First Class Honors) in Electrical and Electronic Engineering from Imperial College London, United Kingdom and a Master of Science (Distinction) in Military Operational Art and Science from the USAF Air Command and Staff College, United States.

CPT Daxson Yap is currently a staff officer in the Force Transformation Office, Joint Plans and Transformation Department. An Air Warfare Officer (GBAD) by vocation, he previously served in 165 SQN and 18 DA Bn. CPT Daxson holds a Bachelor of Science (First Class Honors) in Mathematics and Economics from the London School of Economics and Political Science, and a Master of Arts in Statistics from Columbia University, United States. CPT Daxson is a recipient of the SAF Overseas Scholarship.