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The RSAF Journey – Voices from the Past, Present and Future

Supplementary Issue in Conjunction with RSAF's 45th Anniversary

Editorial Board

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EDITORIAL

We are pleased to kick off our *POINTER* Supplement for 2013 with an Air Force-themed issue in conjunction with the Republic of Singapore Air Force's (RSAF) 45th anniversary. The theme is "The RSAF Journey – Voices from the Past, Present and Future." Under this theme, the various articles featured reflect on the key developments of the RSAF since its inception, take stock of current developments, highlight less publicized but yet important vocations of the RSAF and look ahead to the next spiral of RSAF's transformation.

The supplement begins with an account of the history of the RSAF, "RSAF in the Past 45 Years" written by SLTC Tay Boon Chong, MAJ Kam Kai Qing and MAJ Oliver Siah. The article traces the development of the RSAF, starting with the First Generation RSAF which focused on building core tactical competencies and capabilities that laid the foundations for protecting our nation's airspace. The Second Generation RSAF expanded operational domains and capabilities and concentrated on hardware acquisitions and structural changes. In the mid-2000s, the transformation of the Third Generation RSAF took place, with key emphasis on technology, force modernization and personnel development and training in a new operational environment.

The second article, "Reflections from Past RSAF Commanders" by LTC Maximillion Goh Wei Shin, MAJ Liao Minghao and CPT Janice Quek, provides insights on issues like leadership, people development and safety, gleaned from interviews with four senior former commanders and the first Chief Warrant of the Air Force (CWAF). The four commanders are MG (NS) Ng Chee Khern, BG (Vol) Jimmy Tan, BG (Ret) Loh Kok Hua and BG (Ret) Gary Yeo. SWO (Ret) William Ng was the RSAF's first CWAF.

ME6 Loh Wai Mun, LTC Aldrin Tan and MAJ David Koh present their perspective on "The RSAF's Training Transformation Journey" which focuses on how the RSAF's training system needs to keep pace with the demands of advanced capabilities and a changing operating environment to better prepare its airmen to meet new challenges.

The fourth article, "The RSAF's Medical Warriors" by LTC Won Jiunn Shyong, ME6 Jeffrey Sim Vee Ming and MAJ Marcel Xu discusses the crucial roles played by the medical community in the RSAF, their capabilities and their contributions in keeping the airmen fit and mission-ready.

ME6 Lim Tiong How, Nelson and MAJ Seah Pi Yee in their article, "The UTG Command Experience," cover the experiences of the Unmanned Aerial Vehicle (UAV) Task Group (UTG) which was deployed to Tarin Kowt, Uruzgan, Afghanistan. In this article, the authors stressed that the success of the UTG was due to the effectiveness of the ground commanders in leading, managing and commanding a dedicated crew, working towards a desired outcome.

The next article, "The Demographic Strategic Imperative and Its Implications for the RSAF" is by MAJ Ingkiriwang Shawn Wei Zhong, MAJ Clement Wee and MAJ Foo Tng Loong. This article describes Singapore's shrinking demography and examines the long term implications and the possible solutions that the RSAF should consider in the light of these challenges.

Finally, we are honoured to have an article by MG Ng Chee Meng, Chief of Air Force (CAF) who provides his insights and take in "Our Culture: The Cornerstone of Our Enduring Success." In this article, CAF shares his reflections on the Air Force culture. He discusses the strategic challenges faced by the Air Force and suggests that dynamic leadership, high professional standards in safety and innovation and fostering a Mission Success-People Centric Culture will help raise the Air Force to the next level in its transformation journey.

The *POINTER* Editorial Team

The RSAF in the Past 45 Years

by SLTC Tay Boon Chong, MAJ Kam Kai Qing and MAJ Oliver Siah

INTRODUCTION

> *"The RSAF has come a long way. Each generation of the RSAF's leadership and men and women has had to face enormous challenges and uncertainties. Each generation has had the ambition and the discipline to overcome these challenges and uncertainties convincingly."*
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> *– Former Chief of Air Force, MG Ng Chee Khern*[1]

The history of the Republic of Singapore Air Force (RSAF) thus far has been characterized by its three distinct phases of operational development. The First Generation RSAF was primarily focused on building core tactical competencies and capabilities which laid down the foundation for protecting the nation's airspace. The Second Generation RSAF was marked by force modernization programs that worked towards building a "system of systems" fighting force emphasizing cross-domain operational competencies in an effort to exploit force multipliers. In the mid 2000s, the RSAF embarked on the transformation into a Third Generation RSAF that is capable of performing a full spectrum of cross-service operations to shape the campaigns of the Singapore Armed Forces (SAF).

While outsiders may see the RSAF's development as a contiguous process of capability development, more astute observers will recognize that each phase of development represented a unique answer to existing strategic circumstances. This article thus serves to analyze the key impetus at each juncture of the RSAF's transformation and highlight significant developmental milestones that exhibit how each generation of airmen responded to these challenges.

FIRST GENERATION RSAF: THE MAKING OF AN AIR FORCE (1968 TO 1985)

> *"An Air Force ... did not constitute a force if there were not the people with the expertise."*
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> *– Former Prime Minister, Mr Lee Kuan Yew, 1968*[2]

When Singapore became independent on 9 August 1965, the defense priority was to quickly establish an army that was capable of handling internal and external security. At that time, there were no plans to concurrently develop an air force as there was still

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1 *40 Years of the RSAF* (RSAF, 2008), 3.

2 Ibid., 11.

a significant Royal Air Force (RAF) presence in Singapore operating out of three major air bases. The RAF's high end fighter aircraft, anti-aircraft (AA) guns and surface-to-air missiles (SAM) provided a credible deterrent in the air theater which was expected to last into the mid 1970s. However, in early 1968, Britain's announcement of its decision to pull out all its forces from the region by March 1971 left Singapore with an urgent need to raise an air force of its own to fill the void caused by the impending RAF withdrawal.

The first step towards achieving this onerous task was realized with the inauguration of the Singapore Air Defence Command (SADC) on 1 September 1968. The formation of the command, merely eight months after the withdrawal announcement, marked the modest beginnings of Singapore's very own air force. The aim of the SADC, which was then one of three elements managed centrally by the General Staff, was to establish a tactically competent air defense force by the time of the RAF's planned departure.

Plans were quickly made to acquire aircraft and weapon systems and to manage the eventual takeover of the air bases and air defense facilities that the British were prepared to leave behind. It was evident that while hardware could be acquired, the air force also required highly specialized manpower, which was not readily available. Thus, the primary challenge that our fledgling air force faced during its founding years was to train a competent core of specialized professionals who would then pioneer the development of the Air Force in the decades to come.

From the onset, it was recognized that a flying school would have to be quickly established to select, grade and train suitable candidates to become full-fledged air force pilots. The Flying Training School (FTS) was founded in 1968 to train the initial batch of 37 pilot trainees. However, the lack of specialized manpower locally meant that the majority of the training for our pioneer batch of airmen had to be outsourced. FTS, then consisting of only two Cessna 172 aircraft hired from the Singapore Flying Club, was initially responsible for only basic pilot training and selection. Successful trainees would then be sent to flying schools in the UK and France for advanced training on fixed wing aircraft and helicopters respectively. Similarly, our pioneer batch of controllers, ground-based air defence (GBAD) operators and aircraft technicians had to be trained abroad or by contracted foreign instructors locally. Such training arrangements that were hugely dependent on foreigners was clearly not sustainable in the long run. Thus in 1969, then Minister for Defence, Dr Goh Keng Swee directed that the SADC be responsible for both operations and training of its airmen. In a speech that contextualized a shift to focus on local training efforts in the years to follow, Dr Goh said, "The previous practice of sending large numbers of personnel overseas even for courses of a few weeks will cease

and the training effort must be carried out here. This means hard work for everybody, but the end result will be that we shall be self-reliant in a crucial field."[3] This philosophy underlined the eventual shift by the SADC towards building capacity to train our airmen locally.

Concurrently, planners in General Staff had to quickly develop an air force that was capable of defending the nation from aerial threats. World War II was still fresh in the minds of our early leaders and the world was beginning to see the potential in influencing wars with air power. A fledgling SADC had to thus demonstrate that it had the capability to deny potential aggressors from employing lethal air assets in the event of war. Due to the lack of resources at the founding of the SADC, British military advisors then recommended a heavy surface-to-air focus backed by a small fighter fleet. First Generation air defense equipment such as the refurbished Bloodhound Mark II SAMs and the Oerlikon 35mm AA guns were quickly acquired in 1969. The SADC also took the British recommendation of the Hunter aircraft as its first operational fighter as the high start-up cost of building a fighter fleet would be mitigated by the British offer of a monetary grant. It soon became apparent that this choice was insufficient for Singapore's context. Firstly, the Hunter fleet did not create a strong deterrent, as it was deemed inferior to aircraft operated by other air forces in the region, such as the MIG-21. Secondly, Singapore's lack of strategic depth was exposed during World War II and the long reach of a fighter fleet with a ground attack capability would be crucial in mitigating this potentially crippling weakness. These reasons necessitated the rapid expansion of the fighter fleet, beginning with the acquisition of A-4 Skyhawks from the US Navy in 1971.

As core tactical competencies and capabilities grew by the early 1970s, our leaders recognized that the next step of development for the SADC and even the SAF as a whole would require deep doctrinal and vocational expertise. This necessitated specialization not only at the individual level but also at the organizational level. In 1975, the SADC was transformed into the RSAF, an independent service in the SAF. Now no longer managed by General Staff, the specialized airmen in RSAF were wholly responsible for the development of air defense doctrines. Further downstream, the need for specialization also resulted in the formation of type-based commands such as the Singapore Air Defence Artillery (SADA) in 1979 and the Air Force Systems Command (AFSC) in 1983.

The RSAF would eventually go on to procure new platforms and equipments such as F-5 supersonic fighters, Super Puma helicopters, C-130 transport aircraft and the RBS-70, Rapier and I-Hawk GBAD systems. By the early 1980s, the RSAF's quantitative growth had seen the formation of five fighter squadrons operating three different fighter platforms,

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[3] Ibid., 20.

two helicopter squadrons, two transport squadrons, six GBAD units and a radar unit. Bolstered by the rapid buildup in terms of order-of-battle (ORBAT), operational training and logistics support, the RSAF was on the threshold of operationalizing itself as a full-fledged air force by 1985.

The RSAF's solid foundation in its primary air defense role also presented it with a fresh set of opportunities. Internally, vocational competencies were consolidated and knowledge transfer was in place through the founding of training institutions such as FTS for the pilots and other schools for air defense controllers and GBAD operators. The RSAF was thus ready to take on more critical roles in Singapore's defense. The booming economy in the 1980s along with the reduced risk of internal security threats also meant that more resources could be committed towards sophisticated weapon systems. Internationally, air power was seen as playing an increasingly important role in supporting surface forces through tactical strikes, air reconnaissance and force projection. A modern air force that was capable of conducting autonomous interdictions while supporting the Army's and Navy's mission would be a strong deterrent to potential aggressors. Most importantly, the RSAF presented Singapore with the best option of compensating for our lack of strategic depth through its early warning and strike capabilities. The RSAF was thus primed for its next phase of force transformation.

SECOND GENERATION RSAF: THE MAKING OF A FIRST CLASS AIR FORCE (1985 TO MID 2000s)

> *"The introduction of new aircraft and air defense systems into the Air Force presents a new challenge for us. With these added capabilities and acquisitions, we should no longer operate them singly, exploiting the potential of each only in isolation. Instead, we should derive the maximum out of them; to do that means welding the various components of the Air Force into an integrated system."*
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> *– Former Commander RSAF, BG Michael Teo*[4]

The introduction of modern technologies and a growing military discourse on the employment of air power in future warfare brought about the need to build an air force that not only possessed isolated platform-centric competencies but also task-level operational competencies to fight as an integrated system. This was the focus of the Second Generation RSAF as it expanded operational domains and capabilities.

It was during this phase of transformation that the RSAF had to overcome the challenge of flight safety. A series of A-4 aircraft related incidents in the mid 1980s raised questions on the safety and quality of the RSAF's flying operations. The vision of

[4] Ibid., 52.

forging a quality air force gave rise to a stronger emphasis on safety. Besides introducing "Safety" as a core value in 1993, the RSAF adopted the "Zero-Accident" philosophy, as the ability of an air force to conduct accident-free operations successfully would be a strong indication of its quality. The Air Force Inspectorate (AFI) was also reorganized between 1991 and 1992 to play a more proactive role in accident prevention. Through these efforts, the RSAF was able to stem the tide of flying incidents in the A-4 fleet.

The force modernization plans continued in the Second Generation RSAF with platform upgrades as well as acquisitions. Due in part to the spate of A-4 incidents, the RSAF undertook the Skyhawk upgrade project, which incorporated engine and weapon delivery system upgrades. This was the most ambitious aircraft-related engineering project that the RSAF and homegrown industry partners had ever embarked on. Following the success of the Skyhawk upgrade project, the F-5s were also upgraded with advanced radar systems in 1991. These projects, besides allowing the RSAF to stretch the value of the defense dollar, represented a maturing air force that was cognizant of its operational needs and capable of producing solutions independently.

The expansion of platform ORBAT also underscored an air force that was comfortable with undertaking new and more demanding roles. For instance, the F-16s acquired to replace the Hunters in the late 1980s represented a quantum leap in the RSAF's air combat capability. An Airborne Early Warning (AEW) capability was also realized through the introduction of the E-2C in 1987. The ability to conduct Air-to-Air Refueling (AAR) missions through the modification of the C-130B aircraft and acquisition of the KC-135 would also enhance the RSAF's operational capability by stretching its combat range and endurance. The RSAF had also taken over the development of Unmanned Aerial Vehicle (UAV) technology and capability from the Army in the late 1980s. The Searcher UAV acquired in 1994 provided the RSAF with real-time persistent tactical battlefield surveillance capabilities. This variety of acquisitions, along with new concepts of operations, enabled the RSAF to achieve the force multiplier effect of fighting as a system where its war fighting capability was greater than the sum of the individual parts.

The Second Generation RSAF also saw hardware acquisitions and structural changes that exhibited the RSAF's ambition to play a larger role in shaping the land and maritime campaigns. The purchase of the CH-47D in 1990 delivered a heavy lift capability for the army. The Tactical Air Support Command (TASC) was also established in 1989 to enhance support of air-land operations. The Fokker-50 Maritime Patrol Aircraft acquired in 1993 to replace the aging Skyvans strengthened the interoperability between the RSAF and

the RSN by providing extended surveillance range. Concurrently, the RSAF increased the complexity and frequency of training with the Army and the Navy to enhance competencies and capabilities in cross-domain operations. These laid the foundation for the RSAF to fulfill its roles on the integrated battlefield.

The late 1990s and early 2000s also saw the RSAF flying the national flag proudly on the global stage through its participation in a slew of Operations-Other-Than-War (OOTW) that spanned Peace Support Operations (PSO) in East Timor to Humanitarian Aid and Disaster Relief (HADR) operations during Operation Flying Eagle in Indonesia. In the aftermath of the September 11 terrorist attacks, the RSAF took on additional operations to defend Singapore against potential terrorist aerial threats. These successful operations highlighted the expanded role of the RSAF in unconventional operations and the increasing spectrum of operations expected of it in the evolving security landscape, and underscored its cross domain operability. The time-critical and unpredictable nature of such missions necessitated "flatter" command structures that would shorten the Observe-Orient-Decide-Act cycle and allow for flexible responses. This further fuelled existing debate questioning the continued relevance of an airbase-centric command structure versus one that was task-centric.

Meanwhile, precision strike capabilities and improved C4I networks enabled the RSAF to harness its potential in the traditional employment of air power. Advances in UAV technology and AAR capability meant that endurance, often seen as a major drawback in air power employment, may no longer be such a strong limiting factor. Successful large-scale, integrated exercises and joint air defense exercises with foreign air forces also validated our airmen's ability to hold their own amongst the leading air forces in the world. Possessing advanced technological capability and both macro and micro competencies, the RSAF was ready to undertake the next stage of its force development in delivering more air power options for the SAF.

THIRD GENERATION RSAF: BREAKING NEW GROUND (2005 TO PRESENT)

"While we may put in place sound organizational structures and acquire more capable aircraft and systems, it is ultimately the men and women that will determine the future success of the RSAF. In a complex and uncertain strategic environment, the operational demands on the RSAF will continue to grow more varied and intense. We can count on the professionalism, fighting spirit and commitment of the men and women in the RSAF to ensure the success of its transformation and future development."

– Former Minister for Defence, Mr Teo Chee Hean[5]

[5] Speech by Minister for Defence at Inauguration of ACC and APGC and RSAF 40th Anniversary Parade, 21 December 2012, http://www.mindef.gov.sg/imindef/press_room/official_releases/sp/2008/28aug08_speech.html.

To address the increasing complexities and expanding scope of the RSAF's operations, the Third Generation transformation necessitated fundamental reforms in both command structure as well as concept of operations. The increasing demands along with the need for organizational nimbleness called for a shift towards a task-oriented command structure. The new structure would not only enhance the RSAF's ability to conduct a full spectrum of operations, but also provide a stronger interface with the Army and Navy to shape the overall SAF campaign. Additionally, it would allow for greater decentralization of system-level operational development within each Operational Command.

In January 2007, the first of the five Operational Commands, the Air Defence and Operations Command (ADOC), was stood up. ADOC became the principal agency for the planning, control and execution of all peacetime operations and air defense. The UAV Command (UC) was the next Command to be inaugurated in May the same year to spearhead the RSAF's development of UAV capabilities. In January 2008, the Participation Command (PC) was inaugurated to fuse air power with both the land and maritime domains. Later that year in August, the last two Commands, the Air Combat Command (ACC), which fronts the development and operationalization of integrated air combat operations capability, and the Air Power Generation Command (APGC), the vanguard for air base operability and aircraft generation, were stood up. The rapid pace of structural transformation from inception to implementation was a testimony to the RSAF's adaptiveness and maturity.

Technology and force modernization remained key enablers in the RSAF's Third Generation transformation. By 2009, the RSAF had operationalized its AH-64D, which provided the RSAF with an Attack Helicopter capability. The G550-AEW was also acquired to replace the aging E-2C, allowing the RSAF to see further and enhance its situational awareness. In May 2009, the RSAF took local delivery of its first F-15SG, which significantly enhanced its air combat capability. The S-70B Seahawk was also operationalized in 2012 to enhance the Navy's anti-surface and anti-submarine capability. Apart from these manned flying platforms, the RSAF also took delivery of more advanced UAVs, such as the Heron 1, which provided the RSAF with its first Medium Altitude Long Endurance (MALE) capability. GBAD was boosted by the acquisition of the SPYDER, which allows for quick reaction to engage aircraft and precision guided munitions. This force modernization process is set to continue in the upcoming years, to ensure that the RSAF retains its combat edge.

In order for the RSAF to fully exploit the capabilities of these Third Generation technologies, it has to ensure that its airmen are adequately trained using new pedagogies and advanced training systems. The new PC-21 used for basic wing training comes with

a full glass cockpit to acclimatize the pilot trainees to the advanced operational aircraft they will soon fly. The M346 is also set to replace the A-4SU in Cazaux as the RSAF's jet trainer. Apart from these new trainer aircraft, the RSAF will also leverage on simulators for its airmen and women to strengthen both type and task competencies.

As the RSAF continues to induct new capabilities and explore new concepts of operations in the Third Generation transformation, both policy makers and individual airmen are required to employ advanced systems and adapt to new structures. While training in the Air Force had previously focused more on honing operational competencies, personnel development initiatives in the Third Generation RSAF took on a more holistic approach through the implementation of Project CARDINAL in 2007. Besides developing individuals in their professional capacities, Project CARDINAL also sought to realize each airmen's potential and keep them engaged through creating positive work experiences. These efforts took further shape in the inauguration of the Air Force Training Command (AFTC) in 2010 as part of an overall restructuring of the RSAF's training system. In addition to its holistic focus on core value development and vocational training, the AFTC ensures that the RSAF's training system remains relevant in the changing security landscape and operating environment through the regular conduct of Training Needs Analyses. In this regard, the AFTC forms the backbone of a competent and committed workforce for the RSAF's future success.

CONCLUSION

The rate at which the RSAF undertook three generations of development underscored its ability to adapt quickly to changes in the strategic impetus through the collective hard work of generations of airmen and women. In retrospect, it is also important to recognize that the RSAF's capability in our core business of air defense and air superiority remains the foundation in each stage of its transformation. As the strategic landscape evolves and as the RSAF is called upon to perform a wider variety of missions, it is important to remind ourselves of the need to consolidate core competencies whilst pushing the operational envelope.

Reflections from Past RSAF Commanders

by LTC Maxmillion Goh Wei Shin, MAJ Liao Minghao and CPT Janice Quek

The reflections in this article comprise the opinions of four senior former commanders from the Republic of Singapore Air Force (RSAF) and the first Chief Warrant of the Air Force (CWAF). The four commanders interviewed for this article were MG (NS) Ng Chee Khern, BG (Vol) Jimmy Tan, BG (Ret) Loh Kok Hua and BG (Ret) Gary Yeo. MG (NS) Ng Chee Khern was Chief of Air Force (CAF) from March 2006 to December 2009. BG (Vol) Jimmy Tan was Commander Air Defence Systems Division (ADSD) between the period of August 2002 and July 2005. He later became Commandant, SAFTI Military Institute from July 2005 to August 2009. BG (Ret) Loh Kok Hua was former Head Air Operations (HAO) and Commander, Paya Lebar Air Base (PLAB) from March 1995 to April 1998. He later became Commander Tengah Air Base (TAB) from April 1998 to October 1999. BG (Ret) Gary Yeo was Deputy Commander, RSAF from June 1982 to June 1984 and from 1986 to 1990. SWO (Ret) William Ng was the RSAF's first CWAF. He held the appointment from March 2004 to September 2007.

The interviews were conducted individually.

INTRODUCTION

The RSAF started off in 1968 as the Singapore Air Defence Command (SADC) with only two Cessna planes. Fast forwarding to the present, the Third Generation RSAF now operates a wide range of capabilities comprising advanced multirole fighters, unmanned aerial vehicles, heavy lift transport, both naval and attack helicopters, a variety of transport aircraft and modern ground-based air defence (GBAD) systems in a networked and integrated environment. For the RSAF to achieve these capabilities in a span of about 45 years, various personalities in key positions within the RSAF played pivotal roles with their vision, resilience, wisdom and steadiness. These past commanders and leaders of the RSAF led and guided our people through each step of the RSAF's transformation and over the years, experienced its developments firsthand. In this article, past senior commanders and the first CWAF of the RSAF were asked to share their insights on the topics of Leadership, People Development and Safety.

ON LEADERSHIP

> *"Leadership is an art and not a science—in the same way as war fighting is largely an art. In leadership, as in war and art, there are no fixed formulas to be effective. There is only good judgment and good taste. Dogmatic application of the principles of war usually leads to disastrous outcomes ... leaders do not become effective by having a fixed formula of seven habits for example. Leadership requires a judicious mixture of principles to be effective."*
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> *– Former Chief of Air Force, MG Ng Chee Khern*[1]

The topic on leadership is an extensive one and there exists a wide amount of literature on the application of leadership in different contexts and environments. An RSAF officer advancing through the different command and staff tours will need to exhibit a variety of leadership traits. As MG (NS) Ng once wrote in his essay "On Command," there are various aspects to leadership that need to be exercised in varying degrees during different stages of an officer's career.

The three generations of the RSAF are varied in culture, organizational structure and operational demands. In the First Generation RSAF, the focus was to quickly develop core operational capabilities and establish a sense of commitment to defend Singapore's sky. The leadership during the First Generation RSAF was characterized by the military ethos, focusing on building fundamentals in moral ethical values and purpose of military service. During the Second Generation RSAF, the leadership then focused on establishing the force structure capabilities to support the concepts, frameworks, procedures and policies of RSAF operations. In the RSAF's Third Generation journey, the leadership approach adapted to deal with the changing demographics of Singapore and the evolving military profession in a new operational environment.

While leadership philosophies evolved, the core principles underpinning effective military leadership did not change. One of these core principles is our unwavering pursuit for military expertise and professionalism. What are some of our commanders' thoughts on leadership? What did they recognize as the key tenets of a strong leader? In this first section, the past commanders shared their leadership philosophies and the key tenets of leadership that were effective during their command tours.

Personal Leadership Philosophies

There is no single prescribed leadership formula, even for the military. BG (Ret) Yeo reflected on how his leadership style had to change from a more directive style of leadership when he was leading a squadron to a more participative style of leadership

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[1] MG Ng Chee Khern, "Effective Leadership: Contextual and Invariant Dimensions," in *Reflections on Leadership* (*POINTER*, 2005), 7.

later in his RSAF career. He shared that the shift in leadership style was necessary when it became impossible for a single person to have deep knowledge in all areas of operations. To maximize the potential of the organization, BG (Ret) Yeo adopted a consultative style of leadership to harness the subject matter expertise of his leadership team to make effective decisions. BG (Ret) Yeo also shared that as he transited to the civilian sector, similar leadership competencies like professional knowledge, people skills and ability to understand and reconcile complex issues were needed to successfully lead in the corporate world. However, BG (Ret) Yeo pointed out that the time-critical nature of flying operations and decisions may require a more directive leadership style in the RSAF as opposed to the civilian world. He shared that leaders in the civilian world rarely needed to make decisions on the spot, whereas in military operations, commanders must be prepared to make operational decisions based on limited information.

BG (Ret) Loh believed that the requisite leadership qualities of an effective leader transcended all professional outfits. Whether as a Division Commander or company CEO, a leader must essentially possess the same set of core beliefs and people skills to be effective. He shared that not every leader can or needs to behave like General George Patton, the "blood and guts" general. In fact, history would attest that leaders like General Omar Bradley and General George Marshall, two comparatively less charismatic leaders, were equally effective leaders when tasked to shoulder higher command responsibilities as compared to General Patton. He pointed out that "as we rose through the ranks, we needed to constantly refine our leadership styles to adapt to evolving organizational structures and requirements, new generations of war fighters and corporate cultures."

The Importance of Relationship-Building and Engaging Your Men

The first quality that resonated with the commanders we interviewed was the need to build a strong relationship with their subordinates. BG (Ret) Yeo said that "As a leader, you need to know your people, be selfless and genuine to build trust between you and the people you lead." This trust was necessary because the nature of military operations required men to follow their commanders into battle and be confident that they would make the right decisions.

SWO (Ret) Ng believed that a good leader had to understand his men, and be attuned to their needs. It was on this principle that he had apportioned a large amount of his time to engage his subordinates, to continuously learn about their challenges and concerns at work, and to strive to assist them in any way he could. SWO (Ret) Ng felt that when a person was motivated, he would perform at his best, and he would realize the significance of his contributions to the organization.

In a similar way, BG (Ret) Loh believed that an effective leader in a fighting unit must always develop a strong bond of loyalty with his subordinates. He shared that loyalty worked both ways and that he had always stressed this point to his newly posted officers during the first one-on-one interview with them.

MG (NS) Ng shared that one important area for relationship building was to create an environment conducive for initiative and open feedback. He felt that the military had a strong hierarchical system in place, which may not have encouraged people to voice their views and suggestions on how to do things better. Therefore, MG (NS) Ng felt commanders had to create a culture of honesty and openness within the work place to encourage self-motivated initiatives and engender ownership in the RSAF. People who worked in such an environment would also feel more connected to the organization.

Building a Strong Sense of Purpose

The military differs from the average organization in that it requires its people to pledge and defend Singapore with their lives. BG (Vol) Tan noted that this was a noble and meaningful purpose which must be established in the hearts and minds of our people. The men and women of the RSAF need to be aware of their cause and the service they bring to society. By understanding the underlying rationale and guiding principles of their duties, our people would then be able to make the right decisions on their own and pursue their ideas to better the organization. BG (Vol) Tan also related that, during his tour as Commander ADSD, he consciously let his men know the rationale behind their work. He recounted the time when an activation for operations response occurred. During the activation, the crew realized that they had lost the key to the lock of a gate and spent time trying to find the key. The crew was unwilling to break the lock to the gate despite the urgency of the situation. BG (Vol) Tan emphasized that if the crew had understood the implications of failing to respond expeditiously to the operational inject, they would have realized that breaking the lock was necessary and the right thing to do.

MG (NS) Ng recognized that developing this appreciation for defense in the younger generation of Singaporeans might be more challenging for commanders today. Unlike older Singaporeans who had lived through the tumultuous pre-independence days, especially the Japanese Occupation in World War II, and the subsequent nation building, younger Singaporeans had grown up in a relatively prosperous and politically stable environment. The strong emphasis on building a credible and effective defense force could be less persuasive to younger Singaporeans. Nevertheless, BG (Vol) Tan believed that our people inherently want to contribute to a purpose outside of their own self interest, and constantly seek that in the work they do. Therefore, the commander should communicate

to them that national defense was truly a noble purpose and higher calling, worthy of one's diligence and devotion.

Having the Moral Courage and Character to Do the Right Thing

During his career, BG (Vol) Tan often reflected on his role as a commander. He pointed out that it was important for a leader to possess self-awareness and to ascertain the values that constituted his identity. BG (Ret) Loh stressed that a good leader should be consistent in his values and leadership philosophies, and must not deviate from these in a bid to be popular. Beyond the values that one must hold true to, MG (NS) Ng emphasized that commanders need to have the moral courage and character to communicate their beliefs, so as to mobilize their followers on the right values. He cited an incident when he was the Commanding Officer of a fighter squadron. The squadron S1 had asked everyone to collect donations for a charity walkathon, which required a minimum amount of $15 each. Although $15 was not a huge sum of money even in those days, one of his pilots protested against doing this. MG (NS) Ng told the individual and the rest of the squadron that anyone who was not interested in participating in the charity drive could return their walkathon cards to him. The individual was embarrassed and backed down. MG (NS) Ng believed that commanders had the responsibility to set the moral tone of the unit, to enforce it, and not allow anyone from within or outside the unit to degrade it. In addition, as leaders, they need to communicate their values and beliefs and lead by example in order to inspire a similar level of conviction from the people they lead.

Empowering People

Commanders should empower their subordinates and encourage them to take the initiative. MG (NS) Ng shared that this was necessary for commanders to build up capacity for themselves and to develop and provide opportunities for grooming and realizing the potential of those they lead. BG (Ret) Yeo related his experience during the 1983 cable car incident when he was called to participate in the discussions on the possible rescue options in the evening. He recalled that when the decision was made for the helicopters to conduct the rescue, he left it to his pilots and aircrew specialists to do what they needed to do to get the job done. BG (Ret) Yeo said, "You need to trust your people so that they can do the job that they were trained for."

BG (Ret) Loh believed that leaders need to harness the different talents within the organization and allow them to take on responsibilities and ownership in their work. Despite the benefits of empowerment, BG (Ret) Loh also pointed out that there was a need to balance empowerment with close supervision. He said that close supervision was

necessary at times, especially during critical operations, to create a tension within the unit so that complacency, *clichés*, and entrenched norms did not set in.

SWO (Ret) Ng related his time as CWAF to illustrate his experience of being empowered and empowering his subordinates. In this appointment, he had to lead and manage significant changes to the Warrant Officers, Specialists and Airmen (WOSA) Corps. Back when he was still the Air Force Sergeant Major, the Base Regimental Sergeant Major was the pinnacle appointment in the air bases. This appointment was however filled by a Warrant Officer from the Army. Aside from being the Warrant-Officer-In-Charge of a squadron or unit, there was no suitable pinnacle appointment that a WOSA in the RSAF could aspire to. He realized that there was a need to create a structure of top leadership appointments for the WOSA Corps to aspire towards. The WOSAs also needed more structured leadership development programs to prepare and groom them for future leadership appointments. Finally, there was a need to build confidence and encourage the WOSA Corps to take on new roles and responsibilities which they were not familiar with—besides having to champion the structural changes, SWO (Ret) Ng had to encourage and empower them to take on key leadership roles in the RSAF. SWO (Ret) Ng described the situation then, "The WOSA Corps had aspirations but were initially apprehensive about taking on bigger roles, especially those undertaken by the Base Regimental Sergeant Major. I had to be patient and encourage them to move forward, while at the same time set an appropriate pace and direction for their development." The WOSA Corps has since developed significantly and grown in confidence within the RSAF, and this has further inspired other Air Force personnel.

ON PEOPLE DEVELOPMENT

"Today I will tell you again, you are very powerful. Whether you believe it or not is immaterial, whether you know it or not is also immaterial. The influence you have, whether you want to exercise it, is critical to the success of our people development."

– Chief of Air Force MG Ng Chee Meng[2]

The success of the RSAF over the past 45 years must be attributed to the many generations of airmen and women, in particular the leadership who laid the foundation that supports the Third Generation RSAF today. MG (Ret) Bey Soo Khiang once pointed out that the answer to a successful Air Force lay in our people, and it was the strength and character of our personnel that was to make a difference to the SAF. The emphasis in sharpening the RSAF's qualitative edge led to the vision in the 1990s of creating a "Quality Air Force" that was made up of superior individuals and system level capabilities. Not only was the Air Force modernizing its capabilities, significant attention was paid to enhancing our training standards, to train and produce quality airmen and women

[2] Extract from CAF's speech at a CARDINAL event.

grounded on strong core values. Later, as the RSAF approached the new millennium, a new vision was charted out to prepare the RSAF for the dynamic strategic environment and to guide future developments. The Air Force 21 vision of "World Class People, First Class Air Force" was promulgated in 2000 and reflected a renewed emphasis on human resource issues, taking into account wider changes in national demographics and socio-economics. The RSAF wanted to leverage on the better educated workforce that had higher aspirations to take the organization to greater heights. Project Cardinal was one of the key initiatives that the RSAF embarked on to put in place a structure for developing our people and preparing them for the future. It was introduced in 2007 with the three key thrusts of Developing Professionals, Realizing Your Potential and Engaging the Heart. Project Cardinal remains a key focus of the RSAF and the current stage of its implementation focuses on creating positive work experiences, developing a strong and competent workforce, and optimizing our human resources.

The RSAF's approach to people development has evolved through the years. However, there are certain key aspects that remain evergreen to ensure that our people are provided with the right environment and experiences to succeed and to help the RSAF to continue to perform well. Our commanders shared with us how they developed the people under them and their philosophies towards people development.

Placing Command Emphasis

BG (Ret) Yeo opined that the onus was on the leader to train and groom the men and women under him to perform the tasks required of the RSAF. To do so effectively, BG (Ret) Yeo emphasized that the RSAF needed to motivate its people through more than just an attractive pay package. BG (Ret) Yeo believed foremost in providing his people with a career that they could be proud of. He also believed that by entrusting our people with responsibilities, they would develop ownership for what they do, which would in turn motivate them to achieve more.

BG (Vol) Tan agreed that even with a framework such as Project Cardinal, it was ultimately the commander on the ground who determined the success of the framework and initiatives in developing our people realize their full potential. In particular, BG (Vol) Tan highlighted that it was the commander's responsibility to engage the hearts of his people so as to motivate and inculcate a sense of purpose in their contributions. He cited the ongoing operations of island air defense as an example where it was important to *sustain the motivation of our people over long periods in peacetime*. BG (Vol) Tan cautioned that, unlike the early days of Singapore's independence where the motivation and purpose of performing island air defense was clear, this motivation had been diminished after a

prolonged period of standbys without any activation. In this case, it was the leader's responsibility to acknowledge his people's contributions, *inculcate a sense of purpose*, and provide due recognition of their hard work.

BG (Ret) Loh expounded that by investing time to develop our people professionally, we not only helped the individual achieve his potential but also engaged the individual, leading him to cherish and strengthen his relationship with the organization. BG (Ret) Loh highlighted that while systems and programs to develop our people in a structured manner were desirable, we should exercise flexibility in managing the professional and personal development of our people. In particular, BG (Ret) Loh believed that commanders should place extra emphasis in managing and developing the top 5% of super achievers and the bottom 5% of underperformers in the organization.

Focus on NSmen and NSFs

The RSAF's people development efforts must include our Full-Time National Servicemen (NSF) and Operationally-Ready National Servicemen (NSmen). MG (NS) Ng shared how it was important that this group of RSAF personnel cultivate the right attitude and understand the significance of their contribution to the nation. MG (NS) Ng opined that the best way to achieve this was to train our NSFs and NSmen well, deploy them in meaningful roles and engage them through people development. SWO (Ret) Ng echoed these sentiments and emphasized the importance of motivating our NSmen, who had other personal and work commitments to consider. He opined that NSmen should be well-trained to perform operational roles and the need to spend time and effort to develop them just as like the regular corps. He said, "We have to listen to their issues, and build a relationship with our NSmen." By doing so, we would be able to better engage and motivate our NSmen, who constitute a significant portion of our full fighting force.

ON SAFETY

"The RSAF has always accorded a high importance to safety in operations. The long established idea that zero accidents is achievable is a pragmatic one, and it has over the years guided the RSAF in the successful planning and execution of its training and operations, while effectively managing the risks involved. This is all the more critical as the RSAF transits into the second spiral of its transformation towards a Third Generation Air Force. As newer and more capable platforms and weapon systems are inducted, it is important that the operationalization of these capabilities are carried out safely, and concepts and processes are constantly reviewed, so that the RSAF is also smarter and more innovative with the resources that are available."

– Chief of Air Force, MG Ng Chee Meng[3]

[3] MG Ng Chee Meng, *Focus* 66 (January 2011), 2.

Safety has always been a key focus and, uniquely, a core value of the RSAF. The RSAF boldly espouses the principle that "Zero Accidents" is an achievable goal. It strives towards this target through meticulous planning and implementation of risk mitigating measures, without compromising on tough and realistic training. The RSAF also believes that "Zero Accidents" is an indicator of operational capability, in that our ability to sustain a high operational and training tempo without accidents enhances the Singapore public's confidence in the RSAF's capabilities and sends a strong deterrence signal to potential adversaries.

The RSAF's safety culture has undergone significant transformation. As the RSAF introduces new capabilities and develops new concepts of operations, it also continues to find the ideal balance between safety management and fulfilling training and operational requirements. How did the commanders view safety? How did they convince their people that "Zero Accidents" was an achievable goal? In this final section, the commanders shared their reflections on the safety journey of the RSAF.

Safety as a Core Value

It was not until the 1970s that the first accident prevention office was set up in the RSAF. Since then, the RSAF's safety culture has come a long way as we adopt safety as one of the RSAF's core values and reflect this emphasis in the way the RSAF conducts its business. In particular, the practice to openly report and share safety lessons in the RSAF took a while to gain traction. However, as the RSAF matured, this practice quickly gained momentum and became a very key part of the RSAF's safety culture. Today, we have committed individuals volunteering to share the lessons that they have learned in safety forums and commenting actively on the Safety Information System for the benefit of the organization.

BG (Ret) Yeo remembered that the RSAF underwent a challenging period in the 1980s when we built up the fleet of A-4 fighters in a relatively short time. He recounted how in an effort to quickly operationalize these fighters and build up the RSAF capabilities, there was an immediate need to train a large number of pilots quickly. The pilot community experienced great strain in providing the necessary experience and the air logistics community was on a steep learning curve to build up its engineering expertise. As a result, supervision and safety were compromised. BG (Ret) Yeo recalled that it was "a painful lesson for the RSAF." Following a spate of incidents, the RSAF leadership undertook several measures to regain the confidence of the pilots by improving the safety record. These included a complete review of training, operational and engineering procedures,

and where units were thin on supervision, experienced pilots and engineers were brought back from staff appointments to help in the operational and training squadrons. Some of the squadrons were amalgamated to ensure the correct supervisory levels and some older aircraft were retired from the operational fleet. The Skyhawk aircraft underwent a complete refurbishment including engine replacement.

BG (Ret) Loh also observed the transformation of the RSAF safety culture and noted that the RSAF was able to learn quickly from past mistakes and evolve its safety culture to one of its key assets today. BG (Ret) Loh recalled one of his Operational Conversion Unit (OCU) course missions in 141 SQN flying the Hunter in early 1976, back in the "cowboy" years of the RSAF. "I once led a 4-ship formation on descent through Tengah ATC corridor for recovery under Tengah Approach, and we were 'bounced' by another Hunter from 140 SQN on a general handling sortie in the area; this was neither pre-briefed nor pre-authorized. But lo and behold, during the sortie debrief, I was chastised by my PAI (Pilot Attack Instructor) for not aggressively reacting to the 'bounce'; my fighter pilot spirit and leadership had been found wanting!"

Balancing Operations, Training and Safety

Managing safety and balancing it with training and operational requirements was one of the biggest challenges for the RSAF. MG (NS) Ng commented that it was important for commanders to maintain their composure and manage it at the appropriate level of response in every situation. He believed that the ground needed to be assured that the management was able to handle the situations steadily and that the correct emphasis on safety was accorded.

In a similar note, BG (Ret) Loh reflected that upholding safety standards did not mean compromising training and operational requirements. Instead, he believed that an Air Force that demanded high safety standards was a professional force that projected a strong message of deterrence. Reflecting on the years of impeccable achievements by the RSAF Black Knights during the National Day Parades and air shows, BG (Ret) Loh recounted his impression of other aerobatic teams in one of the air shows. He shared that the RSAF Black Knights observed high flight safety standards even while performing thrilling acts that were impressive to the laymen.

To SWO (Ret) Ng, the RSAF's safety culture was a key quality of success for the RSAF and must be maintained in all operations. However, he also cautioned that although we should strive to execute operations effectively and safely, the process and procedures for operations must not be allowed to get too cumbersome by adding redundant layers.

SWO (Ret) Ng said, "We need to constantly review our processes and rules to ensure they remain relevant. Commanders have to reexamine them to build the right safety culture."

On balancing operations and safety, BG (Ret) Yeo recounted the cable car incident in 1983. The RSAF was tasked with the risky mission to rescue the passengers on board the stranded cable cars. While the objective of the task at hand was clear, the RSAF had balanced safety with the operational requirements by conducting mission rehearsals and spending time to understand the danger of the cabin dislodging from the cable and designing measures to mitigate all known risks of the operations. Eventually, the RSAF was able to accomplish the mission safely and successfully. "We did what was required to get the job done safely. We made sure to plan the mission properly and execute it safely and successfully, rather than rushing through without understanding the implications to safety."

Strive towards Zero Accidents

MG (NS) Ng opined that high operational standards was the key to achieving zero accidents in the RSAF. In driving the RSAF towards high operational standards, commanders needed to create an environment that incentivized operationally strong individuals to maintain these standards, yet pressure stragglers to catch up. MG (NS) Ng felt that if the commanders could appeal to the personal pride of the individual, a culture of high performance would be achieved within the operational units because "no one wants to fall behind the pack."

Though it was statistically impossible to have a zero probability of an accident occurring, BG (Ret) Loh reflected on how the RSAF had boldly adopted the philosophy to constantly strive for "Zero Accident" as an organization. He said that it was critical that all of us (in the RSAF) have this mindset, and the attendant work attitudes to want to accomplish the goal of zero accidents while satisfying the mission requirements, the resource and environmental constraints. BG (Ret) Loh also felt that the RSAF's open reporting culture was key to its stellar safety achievement. The focus of any accident investigation must be on finding the true causes quickly and to share the lessons across the organization. BG (Ret) Loh shared on how he managed the investigation of an accident he encountered previously. After it happened, he immediately made it clear to his people that the intent of the investigation was to determine the causes and not to "witch hunt." He also acknowledged that "to err is human" and that one will not be unduly penalized if the error was not a result of negligence. However, he also made it clear that any attempt to cover up a mistake would not be condoned and would be severely dealt with.

BG (Ret) Loh believed that through such an attitude towards safety, the RSAF would quickly recover from any accident and regain the confidence of the people with adequate remedial operations and logistics measures to prevent recurrence.

CONCLUDING REMARKS: REFLECTIONS OF THE TEAM

The former commanders' candid sharing of experiences from their illustrious careers has provided us with real life examples of effective leadership, people development and the importance of a rigorous safety culture in the RSAF. It is also very encouraging that their reflections highlighted key tenets of the aforementioned aspects espoused by the Third Generation RSAF that have guided our transformation journey. Building a sense of purpose by providing strategic and operational rationales; ensuring an appreciation of Singapore's strategic defense imperatives; empowering our people to make the right decisions for the RSAF; continual emphasis and dedication of resources to grooming World Class People (including our NSmen and NSFs) for a First Class Air Force, and embracing the RSAF safety culture as a key asset will resonate strongly with current and aspiring commanders and leaders.

As commanders and leaders, we are vested with the responsibilities to inspire, influence, nurture and demand our people to do their best for the RSAF. We must be role models and uphold the values that the RSAF espouses. It is also important that future RSAF commanders and leaders harness the initiatives and resources put in place by our predecessors, so as to lead and influence our people to contribute in a meaningful way. When our people are inspired and committed to the RSAF, we can be confident that the RSAF's future transformation journey will be a successful one.

The RSAF's Training Transformation Journey

by ME6 Loh Wai Mun, LTC Aldrin Tan and MAJ David Kok

DEMANDS OF A THIRD GENERATION RSAF ON THIRD GENERATION AIRMEN

The Third Generation Republic of Singapore Air Force (RSAF) is conceptualized as a highly responsive, full spectrum and integrated force. As a full spectrum force, the Third Generation RSAF operates in a wide range of environments from peace to war. As an integrated force, the RSAF fights alongside other services, delivering air power to shape surface battles in the land and maritime domains. As a highly responsive force, the RSAF is operationally ready 24/7 and conducts its missions more dynamically than ever before, with the advent of advanced information technology making network centricity possible. The demands of the Third Generation RSAF requires a new type of airman, the Third Generation Airman, to fulfill the mission requirements.

The competencies required of the Third Generation Airman can be understood from the perspective of the vertical and horizontal dimensions. More capable multirole platforms result in a steeper learning curve as the Third Generation Airman needs to build deeper skill foundations to exploit the full capabilities of the platforms. On the other hand, the complex operating environment, with more uncertainties, more fluid developments, higher operational tempo and increased scrutiny from the media and the public places additional demands on the airman. This requires the airman to gaze upwards to understand strategic intent and how individual initiative in a tactical mission can have strategic implications. In addition, the integration of capabilities within the RSAF and across the services in the Singapore Armed Forces (SAF) requires the Third Generation Airman to better understand how the individual fits into a task that brings together different domains, functions and vocations. To keep pace with the demands of advanced capabilities and a changed operating environment, the RSAF's training system is transforming to better prepare the Third Generation Airman to meet the new challenges.

FROM TRAINING TO LEARNING: A LEARNER-CENTRIC METHOD OF INSTRUCTION

The organization of training in the founding years of the RSAF was driven by the need to quickly build up air defense capabilities in anticipation of the British withdrawal by

the end of 1971. The rapid acquisition of various platforms, from fixed wing aircraft such as Hawker Hunters and Strikemasters, to rotary wing aircraft such as the Alouette III, to ground-based air defence (GBAD) platforms such as the Bloodhound and Oerlikon 35mm guns, naturally resulted in a focus on establishing type competencies. This translated into a training system that was decentralized and platform-focused in nature. As a consequence, distinct identities and cultures developed amongst RSAF personnel along the lines of the platforms they flew, operated or maintained.

The lack of local professionals required the RSAF pioneers to be sent overseas for training. The local Flying Training School (FTS), Air Technical Training School (ATTS) and Electronics Technical Training School (ETTS), set up in 1969, similarly required a mix of contracted instructors and those "loaned" from other militaries as training assistants.[1] Focus was quickly put on building local instructional competencies, which also facilitated the development of RSAF ethos and standardization of *ab initio* and operational training. However, the training of our people continued to occur along vocation and platform lines. Methods of instruction were largely reliant on the quality of the instructors and imparting of implicit knowledge was an important component of an RSAF Airman's training. The latter typically occurred outside of classrooms at the mess or during social functions, which allowed the instructors to interact with the trainees in an informal setting and to impart their knowledge through personal stories. Instructors were able to give vivid accounts of their experiences and lessons learnt, which enhanced their effectiveness as instructors and, at times, made them larger-than-life for the trainees.

This instructor-centric method of instruction was akin to an apprenticeship for the trainees. Trainees who made the grade were those who had the required aptitude and adapted well to the method of training. Those who could not adapt their learning to the training dropped out. The incentive was always present to reduce the dropout rate because of the keen competition for talent and the cost associated with training, particularly for pilots. The need to transform the method of instruction for the Third Generation Airman was further driven by changing demographics resulting in a more educated, highly mobile and smaller eligible workforce to recruit from. In addition, recruits faced a steeper learner curve arising from the introduction of advanced technology in more capable platforms. To meet these challenges, the method of instruction in RSAF has shifted from training to learning, centered not on the instructor but the learner. It has shown early promise with a significant increase in pilot trainee passing rates in the Basic Wings Course. The learner-centric method of instruction leverages on new technology and concepts to enhance the learning process, consisting of the three aspects of structured, self-paced and experiential learning.

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1 *40 Years of The RSAF* (RSAF, 2008), 11, 40.

Structured learning consists of a systematic curriculum design and management that allows an Airman's progress to be monitored by a Training Information Management System (TIMS) and facilitates appropriate intervention by the instructors. In essence, it is a curriculum that identifies not only all the skills and knowledge required by the Airman but by virtue of its design can also be customized by the instructor to address specific training needs of the individual learner. The curriculum design is based on the SAF Training Development System (SAFTDS) model, which determines what, where, when and how to train so as to develop a syllabus that yields the best results for learners.[2]

Structured learning is supported by a Learning Content Management System (LCMS), an e-learning tool that can create, store, manage and distribute digital learning content from a central repository. This repository facilitates the translation of implicit knowledge to explicit content, reduces duplicate content development effort and allows content standardization. The contents of LCMS can be used to support self-paced learning through the use of interactive digital media in Computer Based Training (CBT). In addition to creating capacity for instructors to conduct higher value face-to-face instruction by reducing the number of instructor-led training events, CBT enables the Airman to review the training material at his own time and pace beyond a classroom environment for better comprehension and internalization.

Technology advances in aircraft maneuver instrumentation also facilitated the transition from individual to team learning during high end training. Prior to the use of the Air Combat Maneuvering Instrumentation (ACMI) system, mission debriefs relied on pilot memory and simple camera stills to reconstruct the sequence of maneuvers. In the heat of combat training, human memory could be unreliable, making an accurate re-creation of events challenging. Accurate reconstruction of complex operations like large force engagements were next to impossible. Individual skill weaknesses and errors committed were also less evident and could be obscured when recounting the maneuvers based on memory.

The transformation of mission debriefs in the RSAF began with the use of Global Positioning System (GPS) to provide accurate flight path data for mission debriefs. In 1995, a GPS-enabled ACMI system was commissioned for local flying training.[3] The system is able to record every pilot action and simulate missile fire during air combat. The development of this capability allowed useful lessons to be extracted from accurate reconstructions of the missions. More significantly, these reconstructions enhanced team learning by allowing non-participants to critique and learn from the mission. This system will be enhanced with the introduction of an Integrated Briefing and Debriefing System

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[2] The SAFTDS model is a cycle starting with analysis of training needs followed by design, development, implementation and validation of training.

[3] *40 Years of The RSAF,* 75.

(IBDS) that brings together mission planning, CBT courseware, aircraft data recording system and ACMI for training in the Third Generation RSAF. The mission data in the IBDS can be captured by the LCMS to update or create new content, in addition to sharing lessons from the mission amongst aircrew for team learning. The ease of data access and manipulation designed into the IBDS will also allow simulation of "what if" scenarios for validation of doctrine and tactics.

> *"Simulators provide safe training at lower cost for the operators, saving fuel and reducing adverse environmental effects. With the aid of simulators, pilot and aircrew will be able to master the operation and management of aircraft avionics and systems even before they step into the actual aircraft."*
>
> *– Dr Lee Boon Yang, Minister for Labor and Second Minister for Defence, 1992*

Experiential or hands-on learning is the most essential part of any skills training and development for an Airman. Because it is conducted on actual platforms, it is also the most costly form of training. The RSAF has been using simulators such as the Goodyear flight simulator since the 1970s to prepare pilots for training on actual aircraft. Increased importance of simulator training, considering the financial and opportunity cost of using actual platforms for basic training, led to the inception of the Flight Simulator Center (FSC) in 1987, consisting of two Operational Flight Trainers (OFT) and a double domed Air Combat Simulator (ACS).[4] The RSAF's simulator capabilities were further expanded with the introduction of a C-130 simulator in 1992 and the Helicopter Simulator Center in 1995.[5] Use of simulators was also extended into the training of other vocations such as Air Traffic Controllers, Unmanned Aerial Vehicle (UAV) operators and GBAD operators.

The use of simulators for training in the Third Generation RSAF made a quantum leap with the commissioning of the Air Mission Trainer (AMT) in 2006,[6] which enabled team learning in a low risk, controlled setting. The AMT allowed fighter-to-fighter and fighter-to-controller interactions within a common synthetic environment for team-level mission training against Computer Generated Forces (CGF) or against one another. This was a significant improvement over the OFT that could support only procedural and emergency training and the previous Air Combat Simulator (ACS) which supported single aircraft fighter combat training against CGF. Moving forward, advances in PC-based simulation and touch screens has made Desktop Trainers (DTT) and Part-Task Trainers (PTT) feasible and cost effective options for the RSAF to enhance experiential learning for pilot trainees in areas such as avionics systems management, radar system operations, weapons delivery and systems familiarization. Similar technology is being evaluated for training of aircraft

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4 Ibid., 58.

5 Ibid., 73-74.

6 Ibid., 143.

maintenance crews, in addition to the development of a prototype virtual maintenance simulator.

GOING GLOBAL, ENHANCING INTEGRATION, STRENGTHENING IDENTITY

> *"With the increasing airspace squeeze and the expanding RSAF Orders of Battle (ORBAT), overseas training opportunities are key to the future development of the RSAF."*
>
> *– COL Allan Francis Chua, Commander Flying Training School, 2000*

No amount of time spent in simulators can completely replace training on the actual platform. The limited airspace over Singapore for both military and civilian use means there is a limit to the amount of local flying time available to support the increase in demand for both basic and high-end training. These geographical constraints led the RSAF to shift its focus from developing local instructional competencies and institutions to establishing overseas training arrangements in the 90s. This started with the relocation of Flying Training School to Pearce, Australia in 1993.[7] The relocation to Pearce made available a larger airspace, good weather and greater proximity to training areas, which shortened the time for pilot training. The expansion of training conducted overseas continued apace with the creation of Oakey Detachment in Brisbane, Australia for helicopter training in 1998, the Advanced Jet Training Detachment in Cazaux, France in 1999 and Air Grading in Tamworth, Australia in 2000 for basic training.[8] In the same decade, various agreements were also reached for the establishing of Peace Carvin, Peace Prairie, Peace Guardian and Peace Vanguard Detachments in the United States for F-16, CH-47, KC-135 and AH-64D training. In addition, training was also conducted for UAVs in South Africa, helicopters in Koke Kathiem, Thailand and fighters in Pekan Baru, Indonesia and Korat, Thailand.

The formation of overseas training detachments was mirrored by an increase in joint exercises with foreign air forces. These exercises provided a new dimension in training and helped the RSAF learn and develop new tactics. Today, approximately 50% of RSAF flying training is conducted overseas in a training ecosystem that spans four continents. As the Third Generation RSAF progressed from type to task-level training, the training conducted overseas correspondingly increased in complexity. In addition to RSAF-centric, task-level training, integrated exercises such as Exercise Wallaby and Exercise Forging Sabre for sharpening SAF's air-land and integrated strike capabilities took on greater prominence. Some of these overseas exercises have proved to be valuable by allowing the RSAF to benchmark itself against established air forces around the world. These exercises also provided another opportunity for the RSAF to validate its doctrines and tactics.

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7 Ibid., 79.

8 Ibid., 81.

By doing well alongside leading air forces in exercises such as Red Flag and Maple Flag, our airmen are able to demonstrate that "world class people" is not just a tagline, but something they have been trained to achieve.

The integration of the RSAF's *ab initio* schools under Air Force Training Command (AFTC) in 2009 ushered in a new era for its training ecosystem.[9] AFTC completed the consolidation of *ab initio* training silos previously based on vocational and platform types under one establishment.[10] This provided the foundation for task competencies to be laid early in the training of a Third Generation Airman. The formation of AFTC also created the necessary synergy within the command to set up a Training Development Group (TDG) to look into training pedagogy and learning sciences, such as the learner-centric method of instruction. More significantly, AFTC is placed in a better position to continue the development of a stronger Air Force identity, which began in 2000 with the Air Force 21 Vision, through a common curriculum and leadership development for the Third Generation Airman.

The role of Third Generation Airman would be part of a larger task that brings together different domains, functions and vocations conducted in more uncertain and complex environments, spanning the continuum of operations between peace and war. In addition to professional skills training, a strong identity is required in order to develop a sense of purpose that enables our people to better understand their role in the larger scheme of things. This identity, unique to the military profession, requires the Airman to be inculcated with strong core values and military ethos to do the right thing and uphold high standards of ethical behavior, as well as the commitment to act for the nation, the organization and one another. For a mobile workforce, a strong identity is also an advantage in the competition for talent.

REALISING GREATER TRAINING EFFICIENCIES

The quest to realize greater training efficiencies in the RSAF's training ecosystem led it to commercialize the maintenance of trainer aircraft and facilities, whilst retaining the flying instructors in-house to ensure quality of instruction. This began in 1999 with the outsourcing of Super Puma maintenance in Oakey Detachment to a commercial vendor, which was also the first time the RSAF had outsourced maintenance works for a detachment in a foreign country. This was soon followed with the outsourcing of the Air Grading Center in Tamworth in 2000, Transport Wings Course (TWC) in 2004, Rotary Wings

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[9] The *ab initio* schools consist of the Air Force School, Flying Training School and UAV Training School.

[10] The Air Force School was set up to centralize all non-flying training, consisting of the C3, GBAD and Engineering vocations.

Course (RWC) in 2005 and Basic Wings Course (BWC) in 2008. With the experience gained, the next stage in the transformation of commercial training saw the RSAF embark on Public-Private Partnership (PPP) arrangements to better share the cost and risk between the RSAF and its contractors. Its successful implementation in TWC, RWC and BWC resulted in cost reductions of pilot production between 15-25%.

Besides cost, the time required to train a pilot is also a significant indicator of the efficiency of the RSAF's training ecosystem. The need for better coordination between recruitment and the various stages of training from ground school to air grading to flying training manifested itself in waiting time and need for additional sorties to qualify the pilots. An Integrated Product Team (IPT), borrowing concepts from lean production, was formed in 2006 to reduce inefficiencies in the flow of pilot production. The effectiveness of the IPT was evident in the reduction of waiting time by up to 80% and additional sorties by 18%. With the introduction of more capable trainer platforms such as the PC-21 and M346, which have cockpit displays similar to advanced warplanes, higher end training could be conducted at an earlier stage. This narrowed the transition required between training and operational platforms and resulted in shorter qualification time on operational platforms downstream.

PROFESSIONAL AND PERSONAL DEVELOPMENT FOR A FIRST CLASS AIR FORCE

"The success of the RSAF transformation into the Third Generation Air Force will ultimately depend on its people, on the competence of its people and the commitment of its people in making the RSAF a First Class Air Force."

– LG Ng Yat Chuang, Chief of Defence Force, 2007

In the Third Generation RSAF framework, Project CARDINAL was envisioned as a people development initiative to further the quality advantage of its people. Project CARDINAL's framework consists of three thrusts: (1) developing professionals, (2) realizing your potential and (3) engaging the heart to support the development of the attributes expected of a Third Generation Airman.[11] Professional Competency Roadmaps (ProCR) were developed that mapped out the operational type and task competencies required of the Third Generation Airman, with the task competencies further delineated into Common, Command and Campaign levels. To inculcate core values and military ethos, a Learning and Development Framework incorporating the Individual Development Process (IDP) and

[11] The attributes are: being highly competent, committed and living out the core values.

Command Effectiveness Program (CEP) was established.[12] To realize the potential of the Third Generation Airman, a Personal Competency Roadmap (PCR) was developed that laid out the desired behavioral characteristics of an Airman at different career stages. A new path was also blazed with arrangements for the Singapore Institute of Management University (UniSIM) to accredit RSAF *ab initio* training programs, a measure that not only recognizes the quality of the training delivered at RSAF's training institutions, but also creates continuing education opportunities to meet both organization needs and individual aspirations for higher academic qualifications.[13] The introduction of the Military Domain Expert Scheme (MDES) similarly opened up more opportunities for Masters and PhD studies in relevant engineering fields with its longer career length. This realizes both the potential of our people and scope for greater contributions from those who are employed under the scheme.

CONCLUSION – ACHIEVING GREATER HEIGHTS

The transformation of training in RSAF is driven by the need to maintain the RSAF's edge in the quality of its airmen and women by meeting the needs of a changing operating environment and the induction of advanced platforms and capabilities. Advances in effectiveness and efficiency for training were achieved through adoption of a learner-centric method of instruction, consolidation and integration of the training ecosystem, creation of the Professional and Personal Competency Roadmaps, adoption of PPP arrangements for maintenance of trainer aircraft, and the implementation of the IPT. In the next phase, the achievements, best practices and lessons learnt in the RSAF's transformation of *ab initio* training will be applied to operational training. This would achieve optimal training outcomes for the Third Generation Airman in all stages of his or her professional career, and propel the RSAF towards the vision of a First Class Air Force made up of World Class People.

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[12] In the IDP, the supervisors/instructors will have regular coaching conversations, using the Goal, Realities, Opportunities and Way Ahead (GROW) model, with the Airman planning and reviewing his Individual Developmental Action Plan (IDAP) based on his or her desired personal and professional competencies. The IDP provides a comprehensive LD process that is long term and collaborative in nature between supervisor and subordinates, thus engendering a strong sense of ownership by the subordinates. The SAF CEP is designed to prepare a commander and his team to consciously deliberate, plan and make a commitment through an aligned vision. The CE framework is delineated into five components that encompass the periods before, during and post command: *Assuming Command, Continuous Development, Developing Units, Unit Standards & Management and Feedback & Knowledge Sharing*.

[13] The Basic Wings Course (BWC) ground school and Military Domain Expert Scheme (MDES) courses were accredited by UniSIM towards fulfilling credits in the university's aviation undergraduate programs.

The RSAF's Medical Warriors

by LTC Won Jiunn Shyong, ME6 Jeffrey Sim Vee Ming and MAJ Marcel Xu

INTRODUCTION

Since its inception in World War I, air power has developed rapidly. It has become the means to deliver swift and sizable firepower at targets of high value so as to gain a strategic and operational advantage over the adversary.[1] Behind the highly profiled group of airmen stands a core of medical practitioners who toil constantly to keep our airmen fit and mission-ready. Unlike traditional medical support in Army and Navy, medical practitioners of the Republic of Singapore Air Force (RSAF) have a significant preoperational role such as physiology training to prepare aircrew to meet and overcome the physiological challenges of flight, and programs to overcome normal physiological limitations which restrict performance. Our airmen are able to go into operations with greater confidence, knowing that they will be adequately trained and prepared for battle, and well looked after by advanced and effective medical care if they get injured. Our medical practitioners in the RSAF are amongst the silent warriors who contribute in significant ways that are not always visible to many.

This article seeks to highlight the capabilities and contributions of the aviation medical fraternity, comprising doctors, medics, psychologists and other supporting staff. The article will also provide an overview of how this fraternity has constantly pushed the boundaries of medical science to enhance the performance of our airmen.

AIR FORCE MEDICAL SERVICE

Aeromedical Centre

The Aeromedical Centre (ARMC) was conceived in 1982 with the goal of building a centre of excellence for aviation medical expertise. The initial focus was on the selection of pilots and aircrew, as well as on aviation physiology training to prepare aircrew for the rigors of flight. Over the next 30 years, ARMC expanded its capabilities and sharpened its aeromedical approach and policies. In tandem, its organization structure, aeromedical equipment and capabilities grew to keep pace with the expanding RSAF. The ARMC inducted several aviation physiology training (APT) equipment. This included the Hypobaric Chamber, Ejection Seat Trainer, Night Vision Trainer, the Air Force Night Vision Integrated Laboratory (ANVIL) and the Oxygen System Trainer. The commissioning of

[1] P. S. Meilinger, "Ten Propositions Regarding Airpower," 1992.

the G-Flight Environment Trainer (G-FET) in 1996 brought the training of fighter pilots into a new realm. The machine was essential for training fighter pilots in the conduct of effective anti-G straining maneuvers and gaining confidence in a high-G environment without succumbing to the risk of G-induced loss of consciousness.

As the capability of ARMC grew, it went beyond pilot selection to include the use of medical technologies to enlarge the pool of potential pilot candidates. This was important because Singapore's falling birth rate meant that the number of potential pilots was declining and this would pose challenges to operations if not addressed. With greater advancement in technology, ARMC explored ways to harness new medical techniques effectively. One instance was in the use of Photorefractive Keratectomy (PRK), a form of corneal refractive surgery. This procedure would enable the correction of eyesight for potential pilots, thereby allowing the RSAF to increase the pool of potential pilots. ARMC also uses advanced medical facilities, such as the hypobaric chamber, to better evaluate an applicant's suitability for his vocation, rather than relying on history and physical examination alone, for conditions such as allergic rhinitis. With such contributions in the aeromedical field, ARMC became the centre for aeromedical consultation, training and research to support the RSAF.

Aeromedical and Helicopter Evacuation

Other than the medical services at ARMC, there is also a need for the capability to provide medical services to troops and operators stationed outfield. The training footprint of Singapore Armed Forces (SAF) has been growing worldwide, and there could be instances where the SAF is called upon to provide long range medical evacuation capabilities to our men and women while they are training overseas. Through Aeromedical Evacuation (AME), the SAF will be able to extend its reach to provide bridging medical care to these men and women serving in various locations around the world.

Since 1985, the Air Force Medical Service (AFMS) has conducted more than 30 AME missions successfully. The first evacuation was successfully conducted in 1987 with a C-130 aircraft when a heat stroke patient in intensive care was air-lifted from Brunei to Singapore. Better medical evacuation equipment has been procured over time to make sure that our servicemen get the best care possible. For example, the RSAF's transport aircraft (C-130, KC-135 and Fokker-50) can now be configured with the Air Mobile Life Support Unit (AMLSU) to provide Intensive Care Unit (ICU) level capabilities in-flight.[2] The AMLSU is an integrated piece of equipment comprising various medical intervention equipment such as a cardiac defibrillator, a ventilator, and infusion and syringe pumps to allow the medical evacuation teams to perform advanced trauma life support and

[2] "Flight of the Titans," *cyberpioneer,* December 2008; Tan S., "Saving our Soldiers," *cyberpioneer,* April 2009.

advanced cardiac life support procedures in-flight. In 2007, this much improved AME capability was used to evacuate two severely injured SAF servicemen safely from Taiwan.

The evacuation capabilities of the SAF were further developed with the formation of 1 Medical Squadron (1MS) in 2002.[3] As part of the SAF's holistic medical support plan in operations, 1MS provides the critical bridge between forward surgical care that the Army provides in the battlefield and the definitive medical treatment available at the home base. 1MS achieves this through the Heli-Medical Evacuation (HEME) Teams that employ the AMLSU on helicopter platforms. The HEME Teams are different from the AME Teams in that more specialized training and procedures are required for the team to function effectively in the tight confines of the aircraft.

In the case of an injured soldier, the Army Medical Service's forward surgical unit will first treat and stabilize the casualty at the front line. Subsequently, the HEME teams conduct helicopter evacuation to the home base. In transit, the HEME team can closely monitor the patient's medical condition, while having the capability to handle emergencies should his condition deteriorate. The timely application of damage control surgery can effectively lengthen the "golden hour" of casualties—the critical time window for medical intervention to preserve a person's life. While 1MS has an operational focus, it also provides medical support and rapid evacuation for our soldiers on peacetime training. This has also enhanced the RSAF's peacetime Search-and-Rescue (SAR) capability. In a recent example, 1MS was deployed by helicopter to pick up a Greek national onboard a vessel approximately 200nm from Singapore.

A Long Range Rescue

Around 0300hrs on 3 April 2012, a Greek civilian aboard a merchant ship experienced discomfort at his chest area, associated with heart palpitations. Subsequently, he developed weakness on the left side of his body and pain in his left arm.

The ship requested help through the Maritime Port Authority. The RSAF's CH-47 Search-and-Rescue-Long (SAR-Long) was activated for a casualty with a "possible life-threatening heart attack." 1MS was also informed to prepare for this mission. As details regarding the casualty's status were not available, 1MS had to be prepared for a possible scenario of an unstable casualty with an adverse cardiac event.

The CH-47 (SAR-Long) took off with the SAR Medical Officer (MO) and SAR Medic onboard. During the journey to the ship in South China Sea, weather conditions were bad, with heavy rain and lightning. This made for a cold and damp environment within the cabin.

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[3] "1 Medical Squadron Attains Full Operational Capability," *Air Force News* 109, January 2009.

On arrival at the location of the merchant vessel, the SAR MO was winched down to assess the casualty. The civilian complained of chest pain and weakness as well as pain in his left hand. A decision was made to winch the casualty up using a stretcher as he was unlikely to be able to hold on tightly during winching given his medical condition.

Onboard the CH-47, the casualty's vital signs and oxygen levels were monitored and found to be stable. A modified Electrocardiogram (ECG) was performed to detect secondary unstable cardiac rhythms that may have arisen. The required drugs were administered.

There was a high risk of hypothermia because of the strong wind and piercing cold rain. In view of the adverse conditions, thermal blankets were used to protect the casualty. He was also shifted to the aft of the cabin where he could be partially shielded from the bad weather.

Operational concerns included the long flight time of about two hours back to Singapore. This was important as the crew had to fly in dark conditions using Night Vision Goggles (NVG), maintain vigilance throughout the long flight and handle the aircraft in the inclement weather. Other concerns faced by the SAR MO and the medic included performing medical interventions in an helicopter environment, with vibration and noise being significant challenges.

The casualty was handed over to the National University Hospital (NUH) emergency department team. He underwent an emergency cardiac procedure to clear two critical blockages in his coronary arteries and subsequently made a good recovery. The timely rescue had saved his life.

Operational Contributions of ARMC

ARMC has contributed significantly not only within Singapore, but also internationally. Their contributions range from Aeromedical Evacuations (AME) and Humanitarian and Disaster Relief (HADR), to Peace Support Operations (PSO) and exercise support. ARMC has been as far north as Alaska, and as far down south as New Zealand, in support of training exercises and other peacetime operations. This wide range of contributions has built up a reputation not only for ARMC, but also for the SAF and for Singapore. For instance, ARMC was at the forefront of the HADR mission, Operation Flying Eagle (OFE) to provide assistance to Indonesia after the devastating Boxing Day Tsunami in 2004 that left many badly damaged areas inaccessible by land. Along with RSAF helicopters, ARMC personnel in Search-and-Rescue missions provided swift and responsive assistance to those in need.

ARMC also participated in various PSOs over the years and contributed medical practitioners as part of the larger SAF Medical Corps' missions in various Areas of Operation. In 1990, ARMC personnel were deployed as part of the SAF medical team to support the coalition operations in the Middle East. More recently, the RSAF Medical Corps also sent a team on PSO in Afghanistan. This significantly advanced Singapore's standing in the eyes of coalition partners. Again in 1999, ARMC participated in the East Timor PSO as part of the International Force in East Timor (INTERFET) and thereafter with the United Nations Transitional Authority in East Timor (UNTAET).

PERFORMANCE ENHANCEMENTS FOR AIRMEN

Medical science has been continuously applied in a structured approach to optimize operator selection and to enhance their effectiveness during operations. Maintaining the performance of aircrew and soldiers at high levels is essential for all operations. With the availability of new assistive technology and performance enhancers in medical science, aircrew can better maintain a keen mind throughout the mission.

The RSAF's Approach to Fatigue Management

Various tools can be employed to assist aircrew in coping with fatigue during operations, especially those that require long hours of focused attention. Successful fatigue management involves a three-pronged holistic approach to tackle sleep loss and circadian clock disruption—*prevention, detection* and *intervention*.

Prevention is better than cure. In order to prevent the effects of fatigue from affecting soldiers' operational performance, aircrew should obtain sufficient quality sleep, and have their work-rest cycles synchronize with their circadian clocks. The RSAF prescribes strict rules on maximum flight duty times and minimum crew rest periods to prevent fatigue from setting in. Units with 24/7 standby duties and shift work are also advised by ARMC on the optimal work scheduling to synchronize the shift cycles with their circadian cycles and achieve optimal performance. Finally, through workshops and briefings, every crewman is educated on good sleep hygiene to cultivate desirable sleeping habits.

Fatigue detection is the second prong in the RSAF's fatigue management strategy. Fatigue detection refers to the assessment of aircrew fatigue levels through prediction tools or on-site measurement devices. These tools allow for the dissection of the mission profile and the identification of likely phases of operation when fatigue may be an issue. As an additional layer of checks over the prediction tools, on-site devices may also be used for fatigue measurement prior to launching unplanned missions. To this end, ARMC

has developed a suite of measurement devices which assesses different facets of fatigue based on physiological, cognitive and behavioral or emotive indicators. The suite takes less than ten minutes to administer and provides an additional tool for commanders in crew selection.

In situations where fatigue prevention measures are exhausted, fatigue intervention measures are used. This involves the use of fatigue countermeasure medication to either enhance sleep or alertness levels. For instance, the pharmacological sleep aid *Zolpidem*, a short-acting hypnotic, is approved for use in the RSAF to assist in initiating or sustaining sleep in difficult rest environments or under conditions of jet lag or shift work. In other instances, alertness enhancers such as Caffeine Lozenges and *Modafidil* provide short term boosts of wakefulness and concentration. This is especially useful when aircrew embark on long flights or operate in their circadian troughs.

Fatigue management is not limited to manned aviation but is also relevant to other RSAF operators. For example, ARMC recently assessed the optimal manpower composition for Ground Based Air Defence (GBAD) units to ensure that sufficient manpower is allocated for an alert force during 24/7 operations. Another application is in Unmanned Aerial Vehicle (UAV) operations, which play a key role in providing battlefield situational awareness through Intelligence, Surveillance and Reconnaissance (ISR) missions. ARMC advised on the optimal shift scheduling for UAV operators so as to maximize their vigilance level for ISR missions.

While there are benefits to the use of fatigue countermeasure medication, the RSAF is careful in the prescription of such medications—the medications are only used as the last resort, after all non-pharmacological measures are exhausted. To prevent abuse of such drugs, a strong system of checks and balances is in place to ensure that the issue and usage of such drugs is done under controlled conditions.

CONCLUSION

In the RSAF, medical practitioners are making significant contributions in many ways which are not always visible. They bring specialized capabilities such as AME and HEME to address the unique demands of air operations by contributing not only in peacetime standby SAR, but also in HADR missions. If the operators are akin to the sharp end of the spear, the medical practitioners are the craftsmen who sharpen the spear. Although our medical practitioners' contributions to air power are not always publicly profiled, these silent air warriors have certainly come a long way in enhancing the RSAF's abilities to project air power.

The UTG Command Experience

by ME6 Lim Tiong How, Nelson and MAJ Seah Pi Yee

INTRODUCTION

The Singapore Armed Forces (SAF) and the Republic Singapore Air Force (RSAF) deployed a 52-man Unmanned Aerial Vehicle (UAV) Task Group (UTG) to Tarin Kowt, Uruzgan, Afghanistan, from August 2010 to November 2010. The UAV Task Group was deployed to Multi-National Base Tarin Kowt (MNB-TK) to provide Intelligence, Surveillance and Reconnaissance (ISR) capability to the Combined Task Force – Uruzgan (CT-U) of the International Security Assistance Force (ISAF), as part of Singapore's overall contribution towards the multi-national stabilization and reconstruction efforts in Afghanistan.

This was the first operation undertaken by 128 SQN in Afghanistan. The UAV detachment comprised of 33 personnel was led by LTC Paul Tan as Detachment Commander, supported by MAJ Seah Pi Yee and MAJ Low Jun Horng as Officers-in-Command (OC), MAJ Augustine Tan and CPT Brandon Tang as the UAV Mission Planners and ME6 Nelson Lim as the Senior Maintenance Officer (SMO).

The successful deployment of the UTG could not have been achieved without the exercise of good command skills by the ground commanders. The deployment also provided a good opportunity for the SAF to gain command experience in a Peace Support Operation (PSO).

COMMAND, LEADERSHIP AND MANAGEMENT

In the study of military science, much has been said and written about command, leadership and management. In a military organization where mission success does not depend solely on the deployment of superior technologies and hardware as a force multiplier, the effectiveness of ground commanders plays a crucial role. For a ground commander to exercise effective command and control over a mission, he first has to be effective as a leader, manager and commander. This means a ground commander must be able to "Lead Well" as a leader, "Manage Well' as a manager, and "Judge Well" as a commander.

This article will attempt to relate the command experience of UTG through the lens of the ground commanders in their roles as leaders, managers and commanders.

LEADING WELL

> *"Leadership is visionary; it is the projection of personality and character to inspire people to achieve the desired outcome. There is no prescription for leadership and no prescribed style of leader. Leadership is a combination of example, persuasion and compulsion dependent on the situation. It should aim to transform and be underpinned by individual skills and an enabling philosophy. The successful leader is an individual who understands him/herself, the organization, the environment in which they operate and the people that they are privileged to lead."*[1]

From the quote above, we can clearly identify the key component of leadership as the *ability to inspire and influence, in order to achieve a desired outcome*. In UTG, this desired outcome was to ensure success in every UAV mission that was tasked to the detachment. The role of the ground commander was to inspire and influence his team towards the attainment of this desired outcome by (1) ensuring confidence and competency, (2) knowing his team and (3) caring for soldiers. This was of utmost importance as the success of every tasked mission had a direct impact to the survival and performance of ISAF troopers on the ground who depended on the intelligence provided by the UAVs.

To be able to lead well, ground commanders are required to be *confident and competent* as they are expected to be subject matter experts in their respective fields, forming the bedrock of effective command and leadership. The SAF has provided our ground commanders with such expertise through years of training and experience accumulated in both local and overseas exercises. This has allowed our ground commanders to make sound assessments when faced with new challenges in a foreign land. Our ground commanders were able to put up well-thought plans for necessary operational and logistic requirements that not only ensured the smooth conduct of the UTG's operations but also allowed it to counteroffer and value-add to the ISAF's mission.

In preparations leading up to the deployment, commanders participated in two Need Assessment Survey Team (NAST) trips to Afghanistan. These trips were necessary for the ground commanders to understand the actual operating environment, establish contacts with the relevant agencies and authorities to clarify any queries, and coordinate the necessary in-theater requirements. The NAST prepared the detachment for the unknowns. Having walked the ground and understood the in-theater requirements from coalition forces, the commanders were able to identify shortfalls and formulate the necessary strategies for a successful UTG deployment.

Numerous training, sharing, equipment selection and team building sessions were selected and conducted prior to the deployment. Sharing sessions were conducted internally with the SAF Medical Team that had returned from Afghanistan and SAF personnel with PSO experience during pre-deployment Training (PDT).[2] External sharing

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1 "Chapter 1," in *Leadership in Defence*, Defence Academy of the United Kingdom, 2.

sessions were with lecturers from the S. Rajaratnam School of International Studies (RSIS) on the culture, terrain and language of Afghanistan and with the French Air Force (FAF) and Australian Defence Force (ADF), who had operational experience in Afghanistan. In particular, a delegation consisting of UTG commanders and key appointment holders met up with representatives from ADF in Canberra, Australia for sharing on their Afghanistan operation.

These pre-deployment preparations enabled the commanders to shorten their learning curve by leveraging on the experience of those who had been previously deployed. The knowledge gained from the ADF and interactions with coalition partners had prepared the commanders and provided them the confidence to overcome potential challenges at both the planning and execution level. The wealth of knowledge gained built trust among the members of the detachment and enabled the commanders to inspire and influence them to achieve the desired outcome.

The ability of the ground commanders *to know the team* determined the magnitude of their influence on the detachment. Having an intimate knowledge of the personnel involved contributed to the effectiveness of the detachment. A good understanding of each and every operator and Air Force Engineer (AFE) in the detachment gave ground commanders the ability to tailor their leadership style and be familiar and comfortable with each personnel's character. The trust that was engendered by this rapport helped in maintaining morale and motivation when difficulties arose. Additionally, knowing each individual's habits and personality allowed the ground commanders to keep a close watch on any behavioral abnormalities that could indicate distraction or fatigue. In this sense, a thorough understanding of the men gave ground commanders early warning against any potential issues that might negatively affect the team.

It was clear to the commanders that their leadership philosophy was *the sincere care for the people* they led. The emphasis was to make the time and effort to communicate with the crew so that the commanders could gather feedback and hear their concerns. A case in point was that in order to understand the concerns of the crew prior to deployment, interview sessions were conducted for each and every individual, addressing issues ranging from the dangers of operating in a war-torn environment to personal financial management during the period of deployment. Briefings were also conducted for selected family members who needed additional assurance on the safety of the deployment. Selected officers were sent for a para-counseling course to reinforce the mental health of deployed personnel.

The constant threat of indirect fire (IDF) attacks, where the insurgents fired rockets into the coalition compound, made it clear to the commanders that safety of personnel during the deployment was of cardinal importance. Personnel operating on the UAV runway were required to wear protective armored gear at all times as the runway

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[2] Leader of the SAF Medical Team 2009, LTC Kevin Chin sharing his experience in Tarin Kowt, Afghanistan.

location was not within the coalition security perimeter. Efforts were made to provide additional manpower as security for the personnel working outside the protected zone and engineering studies were conducted to customize communication equipment for integration with the protective gear. In addition to issuing protective gear, minimizing the exposure time of personnel to IDF attack was of utmost concern to the ground commanders. As such, much effort was expended in the design and fabrication of an improved UAV tow trolley. The adoption of the trolley and changes to the launch procedure not only reduced the time required to launch and recover the UAV, thus enhancing operational efficiency, it also reduced crew exposure to IDF attack. To battle August temperatures in excess of 40°C, special cooling vests were brought along to prevent heat exhaustion during the preparation phase of the detachment and to help the crew work longer hours under the hot weather. By showing that commanders value every individual and care for their welfare and safety both before and during deployment, much can be achieved.

MANAGING WELL

> *"The allocation and control of resources (human, material and financial) to achieve objectives, often within the constraints of time. Management requires the capability to deploy a range of techniques and skills to enhance and facilitate the planning, organization and execution of the task."*[3]

The above quote on management implies the ability to plan, coordinate and optimize limited resources to achieve a desired outcome. The UTG deployment presented commanders with a set of unprecedented challenges. The first set came from the projection of equipment to Afghanistan via air-freight. The geographical and security conditions of Afghanistan did not permit the projection of equipment via sea-freight—a common mode of transport for UAV detachments. This meant that there was a need to optimize the range and depth of assets and spares that could be projected in-theatre due to the weight limitations of the C-130 and C-17 aircraft that were used. Both the OCs and SMO scrutinized and managed the list of equipment from the operations and logistics perspectives such that the assets and spares were lean enough to enable projection via air-freight whilst maintaining a level of surplus to support any contingencies that might arise during the deployment. One example was the need to balance the number of spare engines deployed with the maintenance capability required in-theater. The engine depot-level maintenance requirement was supported by commercial entities. The long duration of the deployment, coupled with the lack of depot-level maintenance capability of the deployed personnel, saw the need to cater for a large number of spare engines. The SMO overcame this challenge by equipping selected deployed AFEs with depot-level

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[3] "Chapter 1," 5.

maintenance capability prior to the deployment. The optimization of the maintenance capability minimized the numbers of spare engines required as the AFEs were able to perform the required depot-level maintenance on the engines for subsequent usage during the deployment.

Operationally, the commander took the lean manpower resources into consideration, particularly limited trade qualifications among the personnel. As a result, selected operational and logistic crew were dual or even triple trained and qualified to cover each others' roles in the lean detachment.

UAV pilots qualified as Mission Commanders were triple qualified to take on the roles of Internal Pilot and Payload Operators. They were also employed as UAV Mission Planners to augment the lean allocation of only two such personnel. UAV pilots were also triple qualified as Internal Pilot, Payload Operator and operators of the Active Receive Observation Station (AROS). Similarly, the logistic crew were multi-qualified to cover each other's roles. One clear example was the ability to conduct engine tuning in-theater. Such capability is not available to the flight-line crew. However, selected logistic crew were specifically identified, trained and qualified to perform this job on top of their primary role. This unique arrangement was a result of proper planning to tackle the detachment's manpower issues without compromising quality and efficiency. This enabled the detachment to be self-sustainable, with the capability to handle manpower shortages should the need arise. When one of the Mission Commanders fell ill during the period of operation, the detachment was able to shuffle the manpower and ensure the missions tasked to UTG were not compromised.

Management is both an internal and external issue in a coalition environment. The operating environment posed another set of challenges to the UAV mission as the high altitude, thin air and high temperature reduced the lift capability of the Searcher UAV. Commanders thus had to manage the coalition's expectations. Recommendations were made to the coalition forces to reduce UAV mission endurance in view of the need to reduce take-off weight for a better lift capability. The detachment commander played an active role in influencing the mission tasking, which took into account not just the environment but also system capabilities and limitations. The detachment also took the initiative to brief the incoming 101st Airborne Division, which took over air traffic control of the airfield from Dutch forces during the period of deployment. The briefings helped them to understand the airfield operation and our UAV operations. This deliberate decision benefited both the UTG and coalition forces as it not only shortened their learning curve but also facilitated our own operations.

JUDGING WELL

> *"Command is a position of authority and responsibility to which (military) men and women are legally appointed. Leadership and management are the key components to the successful exercise of command. Successful management is readily measured against objective criteria but commanders are not leaders until their position has been ratified in the hearts and minds of those they command."*[4]

Leadership and management are both subsets of command. However, command has the added ingredients of responsibility and accountability. Commanders must therefore have the courage to take action based on limited information, with the welfare of the men at heart and mission success as the end objective. Having a keen foresight of possible challenges and the courage to make recommendations and propose solutions help to engender trust and credibility in the commander, both from subordinates and senior management.

In the case of the UTG, the terrain of the deployment site limited the line-of-sight between the transmitter and UAV when operating in certain sectors of the airspace and could potentially hamper mission success. To resolve the limitation, the Detachment Commander (DC) and his team came up with the idea to place the transmitter on four stacked 20-foot containers. This proposal required lengthy engineering analysis on the structural stability of the containers to support both the weight of the transmitter and the maintenance crew. Based on the information gathered from coalition partners who had similar experiences and open source information on the ISO technical specifications of a 20-foot container,[5] a decision was made to proceed. It was a bold but well-considered option. The detachment took advantage of the capability for containers to be stacked several floors high onboard shipping vessels, with full consideration for the safety of the maintenance crew during both the implementation phase and operational phase when checks and servicing on the transmitter were carried out. This good judgment call resulted in efficient decision making and implementation which was crucial in boosting the morale of the detachment.

CONCLUSION

The success of the UTG was not dependent on superior equipment and technology, but on the effectiveness of commanders in leading, managing and commanding a dedicated crew towards a desired outcome. Commanders must not only be proficient as leaders, with the ability to inspire and influence to achieve the desired outcome, and as managers, to effectively coordinate and make the best use of the available resources, but they must also have the ability to make sound judgment calls while considering the welfare of their men and the potential success of the missions tasked to them. The experience gained from this detachment enabled the various commanders to enrich their command experience and should prove applicable to most, if not all, contexts and settings.

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4 "Chapter 1," 6.

5 ISO standard maximum gross mass for a 20-foot (6.1m) dry cargo container is 24,000kg. The UAV transmitter was less than 1000kg.

The Demographic Strategic Imperative and Its Implications for the RSAF

by MAJ Ingkiriwang Shawn Wei Zhong, MAJ Clement Wee and MAJ Foo Tng Loong

INTRODUCTION

Singapore lies at a major crossroad as the country approaches 50 years of nation building. An increasingly aging population has compounded the woes of Singapore's declining birth rates and intensified the sobriety of our shrinking demography.

This development directly influences the manpower resource pool, not only for the Singapore economy, but also for the Singapore Armed Forces (SAF). It has significant implications for on ability to effectively "enhance Singapore's peace and security" and warrants close attention, particularly in the maintenance of both the regular professional military force and national service.[1]

This article describes Singapore's shrinking demography with the aid of national population data and discusses broad long term implications and possible countermeasures for the Republic of Singapore Air Force (RSAF).

DEMOGRAPHY – A NATIONAL STRATEGIC IMPERATIVE

At a dialog with senior Ministry of Defense (MINDEF) and SAF personnel on the theme of "Security Challenges for Singapore," esteemed statesman and founding father of modern day Singapore, Mr Lee Kuan Yew categorically listed "shrinking demography" as the key challenge facing Singapore.[2] He cautioned that "the serious problem of a shrinking demography [will] impact not only Singapore's economic future but also its security" if this is not adequately addressed.[3] There are two components in Singapore's shrinking demography: (1) A sustained trend of low birthrates and (2) an increasingly aging population.

SUSTAINED TREND OF LOW BIRTH RATES

Low and declining birth rates are not a new national phenomenon. In 1986, recognizing the unforeseen effects of its earlier successful population control measures, the government decided to replace its "Stop at Two" family planning slogan with "Have Three or More, if You Can Afford It."[4]

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1 "MINDEF/SAF Mission Statement," http://www.mindef.gov.sg/imindef/about_us/mission.html.

2 "S'pore needs strong SAF to ensure continued survival: Lee Kuan Yew," *Channel News Asia*, 18 May 2012, http://www.channelnewsasia.com/stories/singaporelocalnews/view/1202160/1/.html.

3 Ibid.

4 "Population Control Policies," http://www.country-studies.com/singapore/population.html.

A slew of government incentives were introduced to elevate birth rates above the national replacement level. Measures included Baby Bonus packages, child and infant care subsidies, maternity and childcare leave and tax benefits for parents. The government also invested heavily in education, healthcare and housing in an attempt to create a "pro-family" environment.

Three decades on, Singapore's Total Fertility Rate (TFR) remains below the national replacement level. TFR refers to "the average number of children that would be born per female, if all females live through their childbearing years of 15-49 and bear children according to a given set of age-specific fertility rates."[5] In 2010, the total fertility rate hovered at a low of 1.15 children per woman, still short of the replacement level of 2.1.[6] Clearly, the nation has yet to witness any strategic developments which may indicate that Singapore has turned the corner on this trend.

AN AGING POPULATION

With enhancements in medical science and longer life expectancies, an increasingly aging population has compounded Singapore's demographic situation. Traditionally taking a back seat in demography discourse, the realities of an aging population have emerged to match anxieties over declining birth rates. This has exacerbated Singapore's course towards a shrinking demography.

This shrinking demography is clearly illustrated in the age pyramid of Singapore's resident population (see Figure 1). This resident population comprises both Singapore citizens and permanent residents.

Age Pyramid of Resident Population

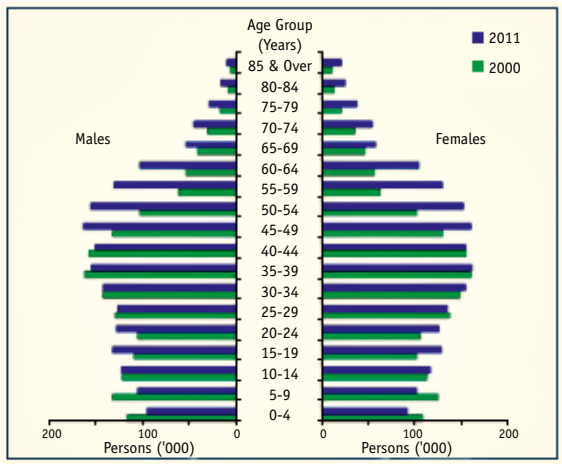

Figure 1: Age Pyramid of Resident Population[7]

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5 "Marriage & Fertility," *Population in Brief 2011* (Singapore: National Population and Talent Division, Prime Minister's Office, September 2011), 29.

6 Ibid., 7.

7 "Population Trends 2011," Department of Statistics, Singapore Ministry of Trade and Industry.

Between 2000 and 2011, the proportion of residents in the age group of 50 to 64 years had approximately doubled. In another ten years, this doubling effect is expected to spill over to the age group of 65 to 79 years and contribute to an expanding pool of nonworking dependent adults.

In the face of a sustained period of low birth rates, a top heavy age pyramid will emerge. This presents several challenges for Singapore. Firstly, the "old age support ratio" will continue to decrease. This ratio refers to the "number of persons aged 15 – 64 years per elderly person aged 65 years and over."[8] Figure 2 illustrates that this ratio has steadily declined from 17.0 in 1970 to 7.9 in 2011.[9] This will inadvertently place heavier responsibility on the working pool of residents to provide support to the aged. Beyond care for parents, this responsibility encompasses other contributions at the national level, including a higher national budget for social support infrastructure. Secondly, assuming no letup in demand for resident workers, there will be chronic difficulties in matching supply. As the post-war baby boomers retire, there will be insufficient young residents entering the workforce to fill the gaps and match the demand for resident workers. This will lead to increased competition for the resident workforce and a stronger push towards using foreign talents to fill the gaps. National institutions which have a high reliance on the resident workforce, such as the SAF, will be hard-hit.

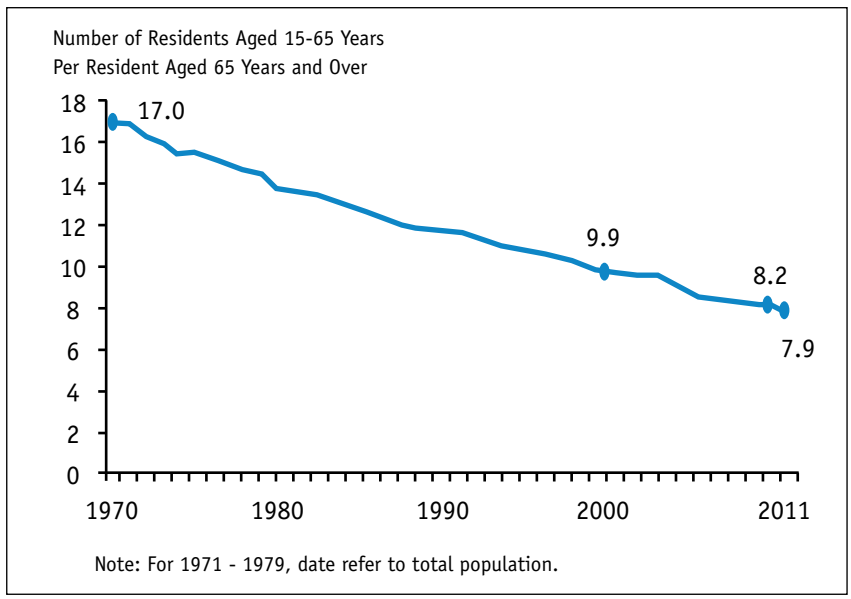

Figure 2: Singapore's Old Age Support Ratio[10]

8 Ibid., 29.

9 "Population," Population Trends 2011, Department of Statistics, Singapore Ministry of Trade & Industry, September 2011, 3.

10 Ibid.

STRATEGIC IMPLICATIONS

This shrinking demography bears serious strategic implications. Singapore's national interest, encapsulated in our pledge, lies in the pursuit of "happiness, prosperity and progress for our nation." In the past decades of nation building, this has been achieved through concerted development in the political, diplomatic, economic, social and military realms.

Singapore's shrinking demography will impact all aspects of our nation building and compromise our ability to pursue our national interest. Notably, there will be competition for the shrinking pool of resident workers and increasing strain on our social support infrastructure. Addressing this shrinking demography must become our national strategic imperative.

HARD TRUTHS FOR THE SAF

There are harsh realities for the SAF on the road ahead. This strategic imperative weighs heavily on the sustenance of a strong and credible defence force. There will be tensions on two fronts—manpower and budget.

As a national institution that relies primarily on the resident workforce for its manpower resource, the SAF will bear the brunt of a shrinking demography. In resolving this manpower strain, the SAF needs to balance between maintaining its operational effectiveness against keeping to its "share" of the resident workforce. It needs to be mindful that this resident workforce needs to be distributed across the various pillars of nation building, such as the economy.

A shrinking demography is also likely to affect the size of our economy and thus the annual government budget. With the growing demand for social infrastructure to support an aging population, there will be increased competition for a share of the overall national budget. In addition, demands from other areas, such as healthcare spending to support an aging population, could make it more difficult for us to maintain a balanced investment in our defense spending. As a result, there will be constraints on the defense budget.

Notwithstanding these tensions, it is important that Singapore continues to place emphasis on security. The SAF must remain as a strong and credible defense force. This was underscored by Mr Lee Kuan Yew when he remarked, "From the day we started, I knew that we needed a strong SAF, and I believe that still remains today. Without a strong SAF, there is no economic future, there is no security."[11]

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[11] "Mr Lee Kuan Yew speaks with SAF Officers and Defence officials at dinner dialogue," MINDEF News Releases, 18 May 2012, http://www.mindef.gov.sg/imindef/news_and_events/nr/2012/may/18may12_nr.html.

HARD FACTS

According to data from the Singapore Department of Statistics, there were a total of 49,402 total live births (resident births) in 1992.[12] This figure provides a proxy on the number of residents eligible for National Service (NS) in 2010. From that year, the number of live births decreased steadily to a then-all time low of 37,174 in 2004, recovered to above 39,000 between 2007 and 2009, before dropping again to 37,967 in 2010.

This data highlights the potential reduction in eligible Full-Time National Service (NSF) manpower and broadly translates to three NSFs in 2029 having to do the equivalent work of every four NSFs today. Similarly, this national population data also points to a potential drop in the forecasted number of Singaporean males serving national service obligations. The data broadly translates to five Operationally Ready National Service (ORNS) residents in 2031 having to do the equivalent work of every six ORNS residents today.

Focusing on the total adult Singaporean workforce from which the SAF's regular servicemen and women would be tapped, the population aged 20 to 50 years would drop from 1.7621 million in 2012 to 1.4152 million in 2031, a reduction of 19.7%. Given this trajectory, recruitment and staffing requirements bear close watching.

LONG TERM IMPLICATIONS FOR THE RSAF

These facts and data have long term implications for the RSAF. The RSAF faces inevitable manpower reduction over the next twenty years. The RSAF needs to prepare itself for this "shrinking demography" scenario and seek to mitigate its impact on our operational capability. The RSAF must ensure that it remains a viable force capable of deterring external threats from the air and defending the sovereignty of Singapore's airspace. To this end, there are several areas which the RSAF could look into to address the implications of a shrinking demography.

Technology

Technology has always been the RSAF's key enabler and force multiplier. From its humble beginning as a force equipped with legacy aircraft from the Royal Air Force, the RSAF has invested in technology over the years to enhance its operational capability. Today, the RSAF is one of the most technologically advanced air forces in the region, armed with some of the most modern equipment.

Going forward, technology will play an even more critical role in the context of Singapore's shrinking demography and literally serve as a force multiplier for the RSAF. Today, advancements in precision and unmanned technologies offer more than

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[12] "Total Live-Births by Birth Order, 1980-2010," *Population Trends 2011*, 79.

enhancements in operational capability. These technologies provide a higher degree of autonomy and present opportunities for a reduced human footprint.

With the advent of precision technology, fewer aircraft would be required for the destruction of targets. Today's precision technology even allows for one aircraft to destroy several targets in a single sortie. There is thus potential to derive further reduction in the human footprint.

Unmanned technology has witnessed significant progress in the past decade, both in capabilities and employment. Traditionally regarded as an Intelligence, Surveillance and Reconnaissance (ISR) platform, we have witnessed paradigm shifts in the use of unmanned platforms as targeting and strike platforms. These have been widely employed by the United States (US) military in targeted strikes on insurgent leaders in Afghanistan, Iraq and Yemen. Besides putting lives out of harm's way, these Unmanned Combat Aerial Vehicles (UCAVs) provide an integrated sensor-shooter platform, minimizing the need for multiple manned platforms for certain missions.

The increasing flight endurance of unmanned platforms is also worth considering. While the jury is still out regarding the comparative human footprint between manned and unmanned platforms and their supporting infrastructure, it is undeniable that unmanned platform operations are less constrained by human physiological factors. Manned platforms are limited by a combination of flight endurance and human physiology. Air to air refueling extends endurance only as far as human physiology permits. Manned platforms need to land for crew changes, elevating the need for aircraft turnaround. Less inhibited by human physiology and coupled with a longer flight endurance, unmanned platforms could potentially reduce the need for frequent ground turnaround and decrease the engineering support footprint.

Productivity

The industrial revolution was a great driving force behind the social change in the 18th century. Before the revolution, the productivity and living standards of the population hardly differed over the centuries. This was also called the Malthusian trap, in which the relationship of the production of goods is linearly correlated to the population. It was the industrial revolution that allowed the global economy to break away from this trap and spearhead large changes in productivity per capita. Production and capability of factories soared, enhancing the standard of living and changing the face of the global economy. This revolution was led by England, which eventually led to the British Empire, the largest empire in history, dominating over a quarter of the globe.

The RSAF must be aware of the Malthusian Trap and constantly seek an increase in sustainable productivity against a backdrop of limited human resources. An airman today, with better processes, networks and technology, can become more effective. With better equipment, education and training, the airman can deliver more capabilities, make better decisions and be more effective overall. Before the advent of computers, many calculations were done manually. Analysis and processing usually took days or even months to conclude. Since the proliferation of computers, however, better analysis and processing can be done in a fraction of the time. Emails and productivity software continue to enhance the efficiency of the individual, allowing them to contribute more.

In the RSAF, technology plays an effective role in raising the productivity levels in a number of our traditionally manpower intensive responsibilities. An example is Force Protection (FP), which ensures the security of our airbases and military installations. High fidelity sensors, high resolution cameras with infrared (IR) capabilities, intrusion prevention technology and biometric access entry are some technologies that significantly increase the productivity and effectiveness of the FP personnel, enabling them to protect a larger area and manage a larger flow of personnel movement, all with less manpower resources required. Such technology applications are a reflection of the RSAF's continued commitment to invest in enhancing the productivity of the individual, team and organization.

"Rightsizing" for the Future

The decline in birth rates will directly correlate to a decrease in the size of our future Order of Battle (ORBAT) as we rely on our citizen soldiers to muster a sizeable force for conventional operations. Facing the impact of a shrinking demography, we must develop plans to invest our limited human resources in high payoff areas. We must rationalize capabilities across the RSAF to determine what we should continue to build, while trimming away the nonessential, bulky or outdated capabilities.

While we leverage on force multipliers, we must ensure that we continue to develop our people. We must provide them with the appropriate training and education to survive and then excel in the modern environment. The RSAF is at the leading edge of force multipliers, the most prominent example of which is the fighter aircraft which delivers massive firepower while being manpower efficient. The RSAF should continue to offer manpower efficient solutions to our future challenges.

Outsourcing

Our forefathers built the nation's defense with the principal consideration that it would be untenable for Singapore, a small state, to maintain a large standing force, as the recurrent costs of doing so would stifle our economic growth. We should rationalize where

we can outsource certain functions so that we will be able to utilize our limited regular force more effectively. For example, the maintenance of our transport aircraft has been outsourced. However, while we determine which areas to outsource, we must exercise caution to ensure that critical operations are not affected. These personnel performing functions which are outsourced, and which form part of our integrated workforce (IWF), are not bound by the code of responsibility inherent to the military. While they may be citizens or permanent residents, an administrative contract may not be sufficient to ensure their commitment to defense in times of conflict or war.

Retirement Age

While Singapore's birth rates have gone down over the last decades, life expectancy has simultaneously increased. According to *Populations Trends 2011*, the life expectancy of a Singapore resident at birth rose from 72.1 years in 1980 to 81.8 years in 2010, an increase of 13%. Today, it is comparable to Japan and more developed European economies such as Germany, Norway, Sweden and the United Kingdom—one of the highest in the world. This is to be expected given the advancement of medical technology and greater education about and awareness of what constitutes healthy living.

If one assumes that this increase in life expectancy translates to a proportional increase in the number of workable years an average person can undertake in his or her life, there is already a potential additional 15% working life that can be utilized to offset the reduction of new recruits due to the low national birth rate. With a bit more flexibility in the way the RSAF employs more senior people, this percentage could come close to offsetting the 20% reduction in recruits mentioned earlier. The returns in this regard could be significant.

At the national level, retirement ages for the economic workforce have been revised upwards to 62. With the recent review of the career schemes in the SAF, the attendant increase in retirement ages appears to be a step in this direction. In conjunction with the review, a new Military Domain Expert Scheme (MDES) was also introduced to cater for deep specialization in certain fields and domains in the SAF. The retirement age of Military Experts (ME) under MDES is set at 60. Such a late retirement age is needed to entrench MEs in their respective specialized technical fields long enough to build the deep expertise required. This also applies, albeit to smaller extent, to the rest of the RSAF. If the RSAF is capable of restructuring or reorganizing itself to accommodate an older workforce without compromising its operational capability, it would help mitigate the impact of Singapore's shrinking demography.

CONCLUSION

The RSAF plays a critical and strategic role in the defense of Singapore. Our manpower resources present both opportunities and constraints. In the face of shrinking demography, these constraints will intensify. However, there are ways in which to mitigate the impact of a shrinking demography. The maintenance of a strong and credible fighting force depends on our ability to turn adversity into opportunity. We need to recognize the challenges and adopt an open mind as we develop solutions to these challenges. Paradigm shifts in the strategic, operational and tactical domains of the RSAF should be expected as we prepare ourselves for the future.

Our Culture: The Cornerstone of Our Enduring Success

by MG Ng Chee Meng, Chief of Air Force
(Collated from speeches and conversations)
February 2013

THE RSAF IN 2025

At the RSAF Strategic Planning Retreat (SPR) in November 2012, about a hundred of us from across different age groups, ranks and vocations came together to discuss the future of the Air Force. We asked ourselves where we wanted the Air Force to be in the year 2025. The consensus among SPR participants was that we wanted to be a highly operationally ready Air Force with a decisive edge over our potential adversaries, and a people-centric organisation with an environment in which we all can thrive. These are simple statements, but by no means simple to realise.

The RSAF has come a long way in our 45 years. We have completed our macro-restructuring effort under Project PHOENIX, and continue to consolidate our progress to realise the full promise of the innovative organisational structures. We have operationalised new technologies and warfighting concepts, with more coming on line in the years to come. We have dedicated a significant amount of time and energy to delve deeper into people development, and commanders have internalised its importance and have a framework for action through Project CARDINAL. These achievements bear testament to the quality of our people. We are a respected Air Force today because of our people: those who have served and those who are serving.

In the next bound, the RSAF will face significant strategic challenges. Firstly, the low birthrate will mean a smaller headcount for us. The Air Force will have to find ways to be more productive. We must innovate to develop CONOPS and processes that will make us more effective and efficient. This is part of what Project CAYLEY seeks to achieve for the engineering and logistics community. Also, the initiatives under the Enhanced Ops Training Framework will help us train our people better, and in a shorter period of time. Secondly, our societal context has changed. Much has been said about the "new normal" and despite the challenges, I think that the RSAF is well-positioned. Our fundamentals are strong—built on years of discipline, long-term thinking, and rational policy-making. Going forward we will need to better communicate our role and relevance, and grow the strong rapport that we have with the public. To do this effectively we will need to

strengthen our tribe to increase our cohesiveness and pride. This is because the people best placed to be ambassadors for the Air Force are our own servicemen—both active and NS.

While we can map out some of these strategic challenges, and take action to address them, the truth is that in our uncertain world there are any number of unknown unknowns out there. By 2025, could we be blind-sided by disruptive technologies? Could our operating context shift even more dramatically due to geopolitical and societal changes? I know that our cheese has already moved, and we need to ask ourselves some important questions: How can we build resilience against the unknown unknowns of the future? How can we bring ourselves up to a higher level of success in 2025? These are questions that we are asking at the Air Force level. They are also questions that are applicable to your units and the teams you lead. In your own context, how have you been preparing the people you lead for the challenges they will face in the future? How have you been laying a good foundation for your people to succeed in the years to come?

I submit to you that the cornerstone of our success as an Air Force has been our strong culture. Our culture is the ballast that will determine the performance of future generations of airmen as they face the unknown challenges of the future. It is in anchoring and growing this culture that we prepare our people for 2025 and beyond. Let me share with you my reflections on our Air Force culture.

WHAT IS CULTURE?

To me, culture is a very difficult concept to pin down. Generally, the definitions boil down to culture as the deepest beliefs and values of a group of people as demonstrated by their behavior. Culture in the simplest sense is about "how we do things around here," but it is so embedded in our being that it defines our worldviews and correspondingly, our behaviors draw deeply from our cultural foundations.

Culture, for this reason, is powerful. It is deeply embedded and so central to who we are that it conditions many things we do. While I may not be able to define culture adequately, we can certainly feel it and the way that it shapes us. Many of you have worked in various squadrons or branches in the past. Very quickly you can sense whether it is a high-performing unit, whether the people are motivated, or otherwise. Moreover, culture is contagious. When a soldier joins a unit that has a strong culture, it gets imbibed by him very easily. Over time, it is a virtuous cycle of success—or when it goes badly, a vicious cycle of sub-par performance.

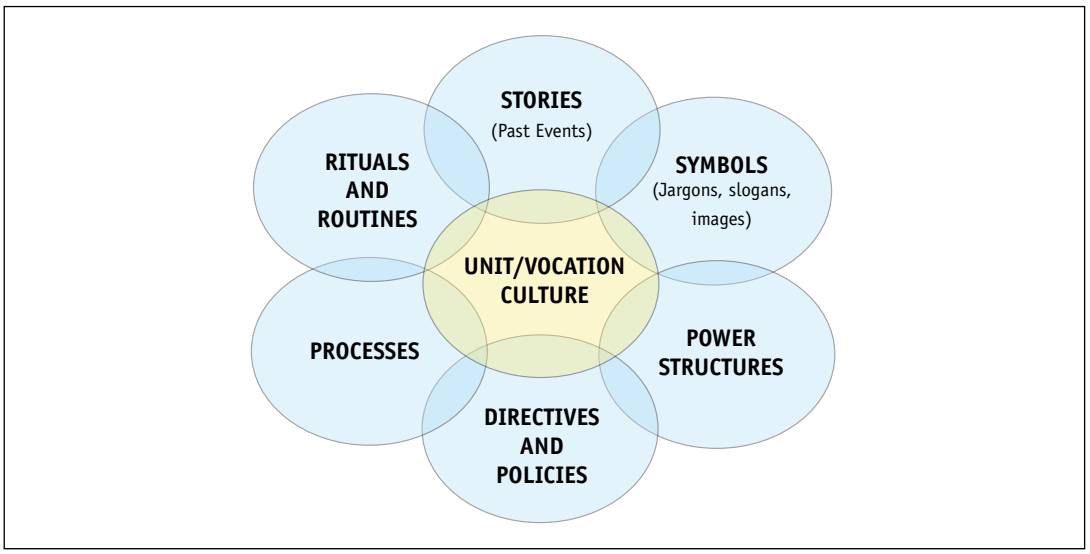

Figure 1: One of the SPR study teams came up with the "cultural web" (above)—a framework to help commanders understand the building blocks of culture. It is useful food for thought—what are the levers available to leaders to shape culture?

Clearly the culture of a unit or staff department has a direct relevance to mission success. While we may share similar observations, I think that our leaders' awareness and understanding of the dynamics of culture have room for improvement. We are very comfortable with the "hard" issues—operations, capabilities, facts and figures, and so on. We are less conversant with the softer issues of leadership—how to forge a high-performing team, how to empower, how to effect lasting change. Leaders need to understand the dynamics of group behavior, and learn how to shape values and behaviors to build enduring success. What are the positive or negative aspects of your unit or department culture? How have these conditioned the outcomes that you have produced? Are there any aspects of your culture that you want to grow, or that you think need to be re-emphasized? Is there anything that you think needs to go?

As I interact with people from across the organization, I see that the Air Force culture is the aggregation of squadron cultures and vocational cultures. These are the two pillars that must be influenced if we want to see lasting change. That is why it is so important that you as a commander or leader take ownership for the culture of your unit or team. While our squadrons and vocations are not identical, I have noticed that there are some similarities that cut across the various sub-cultures of the Air Force. Let me elaborate on them.

A CULTURE OF HIGH STANDARDS

Across the Air Force, we have a culture of high professional standards. We are good at what we do, and we are always trying to get better. We make no apology for training our people to exacting standards, for demanding the best and not just the "good-enough," for being rigorous and thorough in training and operations. This is part of who we are, and it is inculcated in us right from our trainee days. We must never compromise on this.

In 2010 I placed great emphasis on consolidation and levelling up our professional standards to re-anchor our type-level fundamentals after a few years of building the third Generation RSAF task-level competencies. Today, our junior pilots are flying significantly more than what they did three years ago and there is renewed emphasis on improving the training of our people. I think one of the key success factors in this episode was that the Air Force has a forthright culture: we speak our minds and do not mince our words. If we feel that there are things that we can do better or sense potential dangers on the horizon, we consider it our professional duty to speak up and not keep silent. While we continue to treasure esprit-de-corps, we do not mistakenly put personal relationships ahead of professional responsibilities. In any case, we can always have a beer in the mess after robust professional discussions around the table! This forthrightness is a very precious asset.

I would also add that high professional standards does not only apply to the ground units—it is also relevant to the staff departments. As policy-makers, our HQ staff must be rigorous, thorough, and intellectually honest. We must demand quality content and clarity of thought and expression. This is no different from how we push ourselves in the cockpit or out on the field. As a staff officer or branch head, you must take ownership of that part of the Air Force which has been entrusted to you.

Can you say that your flight, squadron, branch, or department has a culture of high professional standards? If so, how can you maintain and grow it? If not, what is your role in effecting change—regardless of your rank and seniority?

We must take pride in our ability to be demanding on ourselves and to always hold ourselves to very exacting standards of performance. This is what makes us a First Class Air Force. Our standards and professional competencies are the pre-requisites to achieving mission success. They are also the foundation upon which the other aspects of our culture are built.

A CULTURE OF SAFETY

Coupled very tightly with our culture of high professional standards is our culture of safety. This duality is encapsulated in our slogan *Mission Success, Safety Always*. It is no mean feat that we are able to fulfil our mission safely with a high tempo of training and operations 24/7, all around the world. Undergirding our safety record is our strong open-reporting culture where we report near-misses and learn from the mistakes that each other commits. Our reputation as a professional and safe Air Force has drawn the interest of other organisations. For example, the Singapore Police Force, SMRT Corporation, and foreign Air Forces like the Royal Air Force have asked to learn from our systems. In fact, many organisations in Singapore today seek out our retiring officers to run the safety shops. They know that our officers are top quality professionals, able to converge both ops and safety priorities.

We must never take our safety culture for granted. It did not come cheap. During the peak of the A-4 crisis in July to October 1985, the RSAF lost four aircraft within a span of four months. We often remind ourselves that our safety procedures and regulations are worth following because they are written in blood. At the strategic level, every incident can chip away at the public confidence in our professional ability as an Air Force. A zero accident record, over time, bolsters our credibility as a professional Air Force in the eyes of those around us.

At the same time, a culture of safety is not about the absence of risk—rather, it is a fine balance between the intelligent management of risk and daring to venture out to improve our effectiveness. When I became Chief, I felt that the balance had tipped to one of excessive caution and risk aversion. Overly conservative practices were hindering us from pushing operational boundaries with more capable platforms and weapon systems. We had to rebalance our safety culture back to "zero accident" and not "zero human factor errors." To do so, we had to learn to be tolerant of honest **m**istakes, while continuing to come down hard on **M**istakes caused by blatant disregard for rules and procedures.[1]

Does your unit have a strong safety culture? Have you trained your people well enough to accomplish the mission, and do so safely? Do your people own up to honest mistakes so that others can learn?

Safety is part of our culture today because of a deliberate effort over the years to embed it in our consciousness. It is our responsibility to train our people realistically, and train them safely. For a commander to do anything less would be unconscionable.

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[1] The distinction between small "m" mistakes and big "M" mistakes was something that I brought to the Air Force's attention in early 2010. The former are mistakes that occur even after careful planning and proper risk management. The latter are Mistakes arising from an indifferent attitude to work or a blatant disregard for rules and procedures. For a further elaboration, see my article *The Problems with Espousing a Zero Human Factor Error Philosophy*.

A CULTURE OF INNOVATION

While our culture of high standards and safety will enable us to achieve mission success at one level, it is our culture of innovation that will enable us to break new ground and propel the Air Force forward. As an Air Force, we have demonstrated our ability to innovate in structures, CONOPS, and processes. PHOENIX is one big innovation that the Air Force is justifiably proud of. Air Power Generation Command in particular, an outfit that is one of a kind in the world, is testament to our readiness to bring together disparate ideas from across the Air Force and from military history to piece together a unique solution for our strategic needs. CAYLEY is also breaking new ground in the training and employment of our engineering and logistics professionals.

Moving forward, it would be useful for us to consider how habits of innovation can take deeper root in our culture. This is not something that is limited to the "big" ideas. Each of us has a role in creatively enhancing the thinking or processes at our own levels. In the course of my workplan speeches, I have highlighted several outstanding ground-up innovations that have helped us to be more productive—including ME2 Brian Pestana's System for Waste Disposal and Foreign Object Damage (FOD) Inspection that saved us 2,500 manhours each year and has since been shared with Changi Airport. The sum total of seemingly small ground-up innovations is powerful.

My own experience has been that innovation takes place when people have a good grasp of the Commander's intent and rationale, but are given the space to operationalize it without unnecessary micro-management from the top. Making sense of myriad, seemingly disparate issues and articulating a clear and compelling problem definition is an essential skill of leadership. Thereafter, it can take many hours of patient discussion for a leader to convince his subordinates of the problem definition, but the quality of our people is such that once they are convinced, they will own the issue and take action in creative ways. Commanders need to understand how to foster this sense of ownership and empowerment that begets creative thinking.

Would you say that your unit or department has a culture of innovation? How much time have you spent as a leader helping your people understand what the problem is, as opposed to prescribing solutions?

Innovation must be part of our Air Force psyche. This culture enables us to adapt to change and is a source of resilience against the unforeseen challenges of the future. It is a culture that Commanders and leaders should encourage at all levels within the Air Force.

FOSTERING A PEOPLE-CENTRIC CULTURE

While our culture of high standards, safety and innovation will continue to serve us well in the future, we need to ask ourselves if these attributes by themselves will ensure the Air Force's success in the years to come. I would submit that in the next bound, a people-centric culture in service of mission success will help us rise to the next level.

The Air Force realized very early in our transformation that we could have the best organizational structure and the very best in technology, but if we did not have the same depth and rigour in the way we develop our people, we would not be able to go very far. That was why we introduced the CARDINAL framework of Developing Professionals, Realizing Your Potential, and Engaging the Heart in 2007.

The framework was a good one, but after CARDINAL had been around for a number of years we noticed that it had a danger of becoming short-hand for "welfare." During the SPR in October 2010, the leadership started discussing how we could really entrench a people development culture in the Air Force. I had to remind the Air Force that people development, just like safety, was in service of mission success. We groom, nurture, and cherish people not only for its immediate good outcomes, but foremost because we have a mission to accomplish. In other words, CARDINAL is both an end in itself and a means to mission success. To ensure that this would be understood easily and implemented by the ground, we developed the two overlays on our CARDINAL framework—to develop a *strong and competent workforce* and create *positive work experiences* for our people. This was a framework for action to focus the minds of our commanders on the outcomes that CARDINAL sought to achieve.

Once our commanders saw that people development was for mission success, it became more natural for them to want to take ownership of the outcomes. This ownership is critical—the ground commanders are the ones who are uniquely well-positioned to effect change for the people they lead. Without it, CARDINAL could have remained just an intellectual framework; it would not be real in the daily lives of our people. At the same time, we also saw that it was important to energize the ground and promote a sense of collective ownership—for example, through the Air Force Story initiative. This command and collective ownership is what will make the CARDINAL framework real.

I think we still have a little way to go to reach a tipping point in realizing a people-centric culture in the Air Force. Intellectually, we have reached a tipping point in the sense that people believe in the principles of CARDINAL and what it sets out to achieve.

However, CARDINAL will truly create a lasting impact on the Air Force if we reach the tipping point where our people own the issues enough to take action in proliferating the culture. We need to make CARDINAL real for the OCs and ME2s and those under them. We need to infuse CARDINAL into our daily activities and take concrete actions to translate this framework into actual outcomes for our people. Each successive generation must want to take ownership of the next, and take concrete action to groom and nurture them to ensure their eventual success. Only then will we have a virtuous people development cycle in the Air Force.

Undergirding this sense of ownership is the Character of our people—moral courage to do what is right and not what is expedient, professionalism to build an Air Force that is strong not only for today but also for the future. It is important that we nurture this Character in the younger generations as well. I sometimes tell people that the difference between the job of a CEO and the Chief of Air Force is that in this job, if it comes to it, I have to order your loved ones into battle. At its heart that is what this profession is about. So a CEO may have the same intellect and drive of a General, but has his character been nurtured to the extent demanded by the profession of arms? It was for very good reason that one of our earlier CARDINAL frameworks stated that the Air Force aimed to develop people who were competent, committed, and imbued with the SAF Core Values. Each of these three aspects are important, but developing character and inculcating values is a higher order and responsibility of military leadership.

Whenever we discuss our people's sense of ownership, I am reminded of a story told by ME6 Michael Tan of his experience when he was the Senior Maintenance Officer in Peace Carvin II. They were having a fleet issue on the engines and the engine people were maxed out. Work needed to be done—a seven day engine run—and there was a long weekend coming. Mike recounted that they had only two engine runners left as the others had crew rest issues. It looked as though they would have to sacrifice the long weekend to get the job done. But that day, ten pilots came to the flight line to work alongside the two engine runners. Working together, they completed the entire operation in thirty minutes. The work was completed, the long weekend was saved. More importantly the team spirit of our people showed: the care that they had for each other built on the back of mutual professional respect and shared experiences. Clearly the pilots and the *Woodpeckers* had forged an environment in which their people could thrive.

This story reminds us that CARDINAL is not just about making people feel good. It is about forging stronger *esprit-de-corps* through demanding and achieving high standards, giving our people a sense of accomplishment, a sense of pride, and helping them see the purpose for which they serve. This peculiar combination of toughness and compassion is truly an art to get right. It is absolutely vital in the new societal context that we don't go overboard and forget the mission, but understand how to make people-centricity real *in service of* the mission.

How might your squadron or department function differently if it had a people-centric culture? What is your role in creating an environment in which our people can thrive? What order of leadership are you exercising—are you training competence, building commitment, and forging character?

Forging a people-centric culture is perhaps the most challenging part of our transformation journey. If we can make this real, the potential is very great. Imagine an organization with consistent high standards, deep pride, and a strong sense of purpose and values. Imagine an environment that is fun and where our people feel happy coming to work each day; where they are given the encouragement to stretch themselves and reach their full potential; where each generation takes it upon itself to groom the next. That would be the sort of Air Force that we would have no hesitation in telling our children to join. It would be an organization with the internal strength needed to meet and overcome new challenges. If you believe in the outcomes and principles of CARDINAL, what are you going to do to make it real for the people around you?

CONCLUSION: WHAT WILL YOU DO?

In September 2010, the Air Warfare Officer (AWO) (C3) recruitment figures were brought to my attention—we were halfway through the work year, and only at 20% of our recruitment target. I recall speaking with the C3 leadership and asking them what was their command responsibility. Was this the Air Force Recruitment Centre's (AFRC) problem to solve, or something that the community wanted to take ownership of? To their credit they took ownership of the problem, worked hard together with AFRC, and we actually exceeded our recruitment target that year. Recruitment figures have been very healthy ever since.

In anchoring and growing our Air Force culture, ownership of the issues is critical—each one of us has a part to play. This is our Air Force and it belongs to all of us. Whatever your rank, you have a sphere of influence around you which only you can exert. If at every level we own that part of the Air Force around us, the net result will be very powerful.

As a commander or leader, if you feel strongly about something in the Air Force, build the conviction and proceed to do something about it. Our actions must correspond with our ideals. Produce outcomes for your unit and create an environment for your people to succeed—even if it means taking tough decisions.

We are driven to do this because we know that the strength of our Air Force contributes directly to Singapore's peace and security. Every day, Singaporeans can go about their daily lives, pursue their economic interests, and live out their dreams because in the background the RSAF is quietly going about our business of safeguarding our skies.

As we look toward 2025, with all its challenges and uncertainties, will we still have *World Class People* and a *First Class Air Force*? In my view the answer lies to a large degree in our culture. It is our culture that will give our Air Force strength, resilience, and adaptability. What we do today to re-anchor and grow our culture will determine whether our success will endure or fade away. Culture is best shaped at the unit and vocation level: you have to take ownership of it in your own context. As you do so, you will be laying the cornerstone on which our people will build in the years to come.

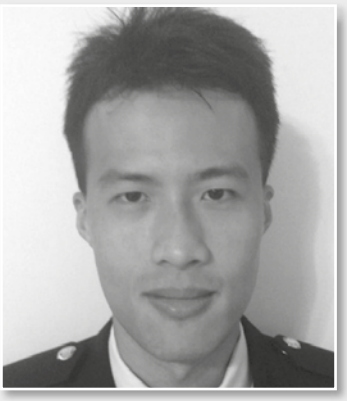
Let me conclude with a question I often ask of our commanders: what will you do for the people you lead?

Postscript: It has been my honour to serve you and our country as your Chief since December 2009. The thoughts in this essay encapsulate the guiding vision that I had for the Air Force over the last three years. I am very proud of the Air Force today, and I have no doubt in my mind that we will continue to grow in strength and overcome the challenges of the future. I wish you well in the years ahead.

About the Authors

The RSAF in the Past 45 Years

SLTC Tay Boon Chong is currently an Assistant Director in Future Systems Directorate. A Fighter Pilot by training, he was formerly a Commanding Officer (CO) in 142 SQN, a Branch Head in Air Operations Department (AOD) and a Branch Head in Participation Command (PC). SLTC Tay is a recipient of the SAF Merit Scholarship and SAF Postgraduate Scholarship. He holds a Bachelor of Engineering (First Class Honors) in Aeronautical Engineering from Imperial College London, UK, a Master of Science in Defence Technology and Systems from the National University of Singapore (NUS) and a Master of Science in Engineering Science, Mechanical Engineering – Guided Weapon Systems from US Naval Postgraduate School.



MAJ Kam Kai Qing is presently a Policy Officer in Defence Policy Office, MINDEF HQ. He was a recipient of the SAF Overseas Scholarship in 2003 and graduated with a Bachelor of Arts degree with General Honors in Mathematics and Economics from the University of Chicago in 2007. A helicopter pilot by vocation, MAJ Kam was previously an operational pilot in 125 SQN.

MAJ Oliver Siah is currently a Section Head in AOD. An Apache pilot by training, MAJ Siah has served as a Staff Officer in AOD. A recipient of the Military Training Award, MAJ Siah graduated from the Australian Defence Force Academy and holds a Bachelor of Engineering (First Class Honors) in Aerospace Engineering from the University of New South Wales, Australia.

Reflections from Past RSAF Commanders

LTC Maxmillion Goh Wei Shin is a Pilot by training and recently graduated from the Goh Keng Swee Command and Staff College (GKS CSC). LTC Goh is a recipient of the Undergraduate Pilot Training Scheme. He holds a Bachelor of Business Studies (First Class Honors) from Nanyang Technological University (NTU).

MAJ Liao Minghao is a Helicopter Pilot. His current appointment is Officer-in-Command (OC) 'B' Flight 127 SQN. He holds a Bachelor of Arts in Economics and a Master in International Relations from the University of Chicago.

CPT Janice Quek is currently a Section Head in AOD. She is an Air Warfare Officer (AWO) (C3) by vocation, and was previously in 203 SQN. She is a recipient of the SAF Merit Scholarship for Women in 2004, and graduated from the University of Illinois at Urbana-Champaign with a Bachelor in Aerospace Engineering in 2007, and a Master in Financial Mathematics from the University of Chicago in 2008.

The RSAF's Training Transformation Journey

LTC Aldrin Tan is currently CO HQ 1199. He is an F-16 pilot by vocation, and was previously a Branch Head in Air Intelligence Department (AID). He has a Bachelor of Science in Electrical Engineering from the University of Illinois at Urbana-Champaign.

ME6 Loh Wai Mun is an Air Force Engineer. His current appointment is Head Quality Assurance Branch, Air Engineering and Logistics Department (AELD). His previous appointment was CO Aircraft Specialist Maintenance Squadron, 5 Air Engineering and Logistics Group (AELG). He holds a Master of Science and a Bachelor of Science in Mechanical Engineering from Stanford University and University of California, Berkeley respectively.

MAJ David Kok is a pilot with the RSAF and just returned from Sekolah Staf dan Komando Angkatan Udar (SESKOAU), the Indonesian Air Force Command and Staff College, in Indonesia. MAJ Kok is a recipient of the SAF Merit Scholarship and holds a Master of Science from the University of Illinois at Urbana-Champaign in USA.

The RSAF's Medical Warriors

LTC Won Jiunn Shyong is an UAV Pilot – IO (Air Int). He is currently a Branch Head in Air Plans Department (APD), HQ RSAF. Previously he was the CO of the RSAF's Heron UAV Squadron, 119 SQN. He holds a Master of Engineering (Aeronautical) from École Nationale Supérieure de l'Aéronautique et de l'Espace (SUPAERO) and a Master of Arts in Defence Studies from King's College London.

ME6 Jeffrey Sim Vee Ming is currently CO of the Air Engineering and Logistics Squadron (AELS) in Air Defence and Operations Command (ADOC). An Air Force Engineer by training, ME6 Sim graduated from the New Zealand Defence Force Command and Staff Course with a Distinction and was also the Valedictorian. Formerly a Branch Head in AELD, ME6 Sim holds a Master of Arts (Distinction), a Master of Engineering and a Bachelor of Engineering (Honors). ME6 Sim also won a Third Prize and a Commendation award in the Chief of Defense Force Essay Competitions in previous years.

MAJ Marcel Xu is a helicopter pilot by vocation, and flies the CH-47 Chinook. He is currently posted to the RSAF Office of Strategy (ROS) within the Chief of Air Force (CAF) Office. He graduated with a Bachelor of Science in Electrical and Computer Engineering from Cornell University in 2004, and a Master of Engineering in Management Science from Stanford University in 2005.

The UTG Command Experience

ME6 Lim Tiong How assumed his current appointment as Deputy CO AELS in UAV Command in January 2012. An Air Force Engineer by vocation, he has served as OC Searcher Flight in AELS/UC, a Section Head in Electronic System Branch and a Staff Officer in Avionics Branch in AELD. He holds a Bachelor of Engineering (Second Class Upper Honors) in Electrical and Electronics Engineering from NTU as well as a Master of Science in Industrial System Engineering from NUS. ME6 Lim is a graduant of the GKS CSC in 2011.

MAJ Seah Pi Yee assumed his current appointment as Deputy S3 in UAV Command in January 2012. A UAV PILOT-IO by vocation, he has served as OC and S3 in 128 SQN and a Staff Officer in AOD UAV Ops Branch. He holds a Diploma in Mechanical and Manufacturing Engineering from the Singapore Polytechnic and is currently pursuing a Bachelor of Science in Business with SIM University. MAJ Seah was a graduant of the GKS CSC in 2011.

The Demographic Strategic Imperative and Its Implications for the RSAF

MAJ Ingkiriwang Shawn Wei Zhong is a F-16 Fighter pilot and a Staff Officer in Strategic Concept and Development Branch, Strategies and Plans Group in AOD. MAJ Ingkiriwang graduated with a Bachelor of Science in Aeronautical Engineering (Distinguished Graduate) from the United States Air Force Academy (USAFA) in 2006. He was the Top Military Graduate at the Academy and as Squadron Commander of SQN 9, led the Squadron to win the United States Air Force Space Command Outstanding Squadron of the Year award in 2006, the first in its 50-year history. MAJ Ingkiriwang is a member of the International Institute of Strategic Studies (IISS) and the Singapore Institute of International Affairs (SIIA).

MAJ Clement Wee is currently a Branch Head in Joint Operations Department (JOD). A pilot by training, he was formerly a Staff Officer in Joint Plans and Transformation Department (JPTD), and a Flight Commander in 121 SQN. MAJ Wee holds a Bachelor of Science in Electrical Engineering from the University of Illinois at Urbana-Champaign, USA.

MAJ Foo Tng Loong is currently an OC in 143 SQN. A pilot by training, he was formerly a Staff Officer in Force Transformation Office in JPTD. MAJ Foo holds a Bachelor of Science in Aeronautical Engineering from the USAFA in 2004.

Our Culture: The Cornerstone of Our Enduring Success

MG NG CHEE MENG
CHIEF OF AIR FORCE
REPUBLIC OF SINGAPORE AIR FORCE

MG Ng Chee Meng joined the RSAF in December 1986. He was awarded the SAF Overseas Training Award (Graduating) to pursue Electrical Engineering at the United States Air Force Academy and graduated with a Bachelor of Science in 1991.

MG Ng graduated from the US Undergraduate Pilot Training Course and received his wings in 1992. He subsequently underwent F-5E Fighter Conversion Training in 144 SQN.

MG Ng attended the Singapore Command and Staff Course in 1999 and graduated as the top student. He was awarded the SAF Postgraduate Award in 2002 to pursue a Master of Arts (International Relations) at the Fletcher School of Law and Diplomacy, Tufts University, USA.

In his 26 years of service, MG Ng has held various key command and staff appointments in the RSAF and the Joint Staff. These include Officer Commanding in 149 SQN, Commanding Officer of 144 SQN, Commander Changi Air Base, Deputy Head of Joint Communications and Information Systems Department, Head of Air Plans Department, Director of Joint Operations Department and Deputy Chief of Air Force. MG Ng was also appointed Military Private Secretary to the Minister for Defence from December 1995 to July 1996. MG Ng assumed the appointment of Chief of Air Force on 10 December 2009.

For his outstanding contributions to the SAF, MG Ng was awarded the prestigious Public Administration Medal (Gold) (Military) in 2011.

MG Ng and his wife, Michelle, have two daughters, Sara and Elisabeth.

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