CHAPTER 3

AIR FORCE BY DESIGN: APPLYING DESIGN FOR TRANSIENT CAPABILITY ADVANTAGES

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The Royal Australian Air Force (RAAF) is required to prepare for, and respond to, a rapidly changing environment that is characterised by high and constant contest. This contest will introduce a number of unprecedented challenges and unfold under conditions of increasing uncertainty and complexity. Significantly, these challenges cannot be adequately resolved by the traditional and functionalist approaches to strategy, force design and capability development that have served the Air Force well in the past. The game has changed. The Air Force needs to apply non-traditional methods to creatively develop and test new theories for how it will generate and leverage adversarial advantages in this new contest.

Rising to this challenge will require the Air Force to think with a dual focus. First, it will be necessary for the Air Force to acknowledge that existing approaches to air power strategy and force design present limitations in generating and applying adversarial advantages in an increasingly complex context. Resolving these limitations requires the understanding and integration of emergent paradigms of thinking that allow the Air Force to deal with complexity, uncertainty, ambiguity and contest in a way that is superior to that of any competitor.[1] Second, the Air Force needs to sharpen its focus on praxis. This will play a key role in the design, testing and iteration of new ways to understand and exploit *sensemaking* (the process of collectively working to understand issues or events that are novel, ambiguous and chaotic and assigning them meaning) for air power effects. Each of these two focus-areas represent considerable puzzles in themselves. However, to meaningfully engage with the challenges that lie ahead, the Air Force will be required to apply its focus on both areas in a manner that is simultaneous and iterative, with insights and learnings from one focus area interacting and shaping those of the other.

This chapter unpacks the contemporary challenges facing the Air Force; introduces Zweibelson's 'blended paradigm' of strategy as an ontological approach to guide the Air Force into the future;[2] and positions *design thinking* and *design innovation* as the methods and cognitive tools best suited to building the new sensemaking capabilities the Air Force needs. This then allows for an examination of praxis—a study will be made of the Air Force's engagement with design methods to build new capability advantages and reshape the relationship that exists between capability development, strategy and force design.[3] This chapter concludes with a series of provocations to inform future research focus areas.

The state of play

The Air Force exists within a context that has become defined by a state of *high and constant contest*. The models of political warfare, coercive diplomacy and grey-zone actions (winning without actually fighting) that are increasingly and effectively utilised by actors in the Indo-Pacific region deliberately blur the distinction between war and

peace.[4] The traditional, western dichotomy of war and peace (the placement of war and peace as opposing *states of being* that rest at opposite ends of a spectrum) no longer holds utility when applied to these realities—the notion of *constant contest* becomes a paradoxical element within this dichotomy, implying a simultaneous occupation of opposing states of being. Within this milieu, rival powers in the Indo-Pacific region demonstrate prowess in using political warfare and multi-domain conflict to win strategic objectives below current thresholds of military intervention—Australia's current military capabilities and force-in-being do not appear to be deterring this.[5] This understandably brings Australia's approach to building and projecting military power into question.

While the need for Australia to recalibrate its understanding of war and peace to better deal with constant contest is recognised within Australia's national security community,[6] models to navigate this construct remain nascent. This is of concern. Within this environment, Australia's potential adversaries range from near-peer sovereign state actors, with access to advanced technologies, warfighting strategies, tactics techniques and procedures—who can mobilise impressively fast and apply power through traditional and sub-war conflicts—through to non-state actors who are well-funded, trained and equipped, with unconstrained freedom of actions to operate in some, if not all, warfighting domains.

The nature of this environment introduces unprecedented complexity. The dominant, functionalist models of military strategy,[7] which are predicated by 'linear-causality, positivistic scientific methodology, reductionism, and the desired elimination of paradox and surprise',[8] cannot adequately explain or begin to deal with this state of play. Principles, rules and patterns—traditionally arrived at through deductive and rationalist strategies—cannot be applied in this new context in a way that offers the explanatory power that the Air Force requires.

Adding further dynamism and complexity to this state of play, the Air Force has embarked on a journey of transformation to become a fifth-generation force.[9] At its heart, this requires the Air Force to be capable of employing a *whole-of-force* approach to air power. Such a transformation enhances the combat potential of individual platforms through instantaneous networking across a joint force. This allows for sophisticated 'cooperative engagement effects by linking distributed sensors, and sharing mission critical data and situational awareness'.[10] While Air Force's fifth-generation journey has its genesis in the acquisition of advanced, fifth-generation aircraft, such as the F-35 Joint Strike Fighter (the term *fifth-generation* itself was originally only intended to describe the characteristics of specific aircraft), the nature of transformation that the Air Force seeks extends well beyond an ability to exploit fifth-generation platforms across domains. In fact, the transformation extends to the essence of the force itself (including force design, force structure and force generation) to deliver new air power effects through a suite of integrated capabilities operating in concert.

In the most contemporary of Australian security discourses the nomenclature of fifth-generation is now also applied to the methods used to shape and better understand the environment in which an integrated force will prepare and operate. The term *fifth-generation manoeuvre* is used to describe the Australian Defence Force's nascent ability to orchestrate a new way of fighting, characterised by increased tempo and new ways and means of projecting power[11] across domains, and the need to conduct an indirect approach to warfare.

The fifth-generation construct (in all its variations) brings a nature of change upon Air Force's strategy, force design, capability and preparedness systems (of systems) that is profound, and offers an encouraging vantage point from which to gaze back at Air Force's legacy approaches to the design, analysis and application of air power. The need for a fifth-generation Air Force to be integrated by design goes part-way to shift mindsets and the capability development emphasis away from the seductive pull of expensive, fast-moving, low-observable and technology-laden capabilities that deliver kinetic and non-kinetic combat effects. Instead, it compels a consideration of force modernisation though a transformation of thinking rather than through the replacement of platforms.

If the Air Force is to effectively operate as a fifth-generation force (a proposition that supposes that the Air Force will have completed the significant and ongoing work required to *integrate* its capabilities, structures, and approaches to force generation), two significant and interrelated complications would need to be overcome. These complications require Air Force to examine both the way it builds and moves pieces across the metaphorical *chess-board* that is its fifth-generation operating milieu and to also examine the nature of the game of chess itself—whether there are conventions that need to be revised in order to develop unorthodox advantages, or whether an entirely new type of game needs to be played instead.[12]

By examining how it builds and moves pieces across the chess-board, the Air Force needs to become increasingly skilled in identifying and deciding what new capabilities are needed to deliver relevant air power effects and ultimately place it in a position of advantage. This will see the Air Force work to fully exploit the potential of fifth-generation technology and concepts in increasingly volatile, complex and uncertain environments. To do so requires the Air Force to be faster, more connected and smarter than it has been in any previous epoch.[13] Importantly, the Air Force will need to decide what these new capabilities are, how they are situated relative to the design of objective and future forces, and how they relate to cycles of open-ended, constant and dynamic contestation with equally capable adversaries.[14] In this game adversaries will be making moves and counter moves to build or exploit advantages of their own, or to avert losses. Responding to this will require the Air Force to harness disruptive thinking in its pursuit of advantages.[15] This is a game and a way of thinking that the Air Force is not accustomed to, as its freedom of action has been uncontested for a generation or more.

To thrive and win in this context, it will be necessary for the Air Force to fundamentally re-examine how it understands, interacts within, and shapes the milieu in which it operates. At the most basic level, this requires the adoption of non-traditional paradigms that explain subjective, non-linear and non-causal relationships as a means to reimagine the interplay between capability development, competitive advantage, force design and strategy. It will be necessary for the Air Force to think about the metaphorical game of chess at the metalevel and about the way the organisation understands its reality, orientates itself within this context, choses courses of action, despite ambiguity, and then makes moves within the game. Doing so adopts a similar heuristic to Boyd's 'OODA loop' and demands air power professionals consider new approaches to strategy design and operational artistry that offer utility in a digital, contested and complex age.[16]

Reimaging the paradigm of strategy in this manner is a considerable task. Nonetheless, it is necessary to consider the kind of thinking—at both ontological and epistemological levels—that should underpin how the Air Force determines the

content of its strategic knowledge construction and how types of strategy should unfold in reality and link with force design, capability development, and preparedness.

The application of the traditional and still-dominant paradigm that western militaries, including the Australian Defence Force, use to think about strategy has significant limitations in an epoch defined by unprecedented complexity. The term 'functionalist strategy',[17] as developed and unpacked by Zwiebelson,[18] is adopted herein to refer to this traditional paradigm. Functionalist strategy is highly useful for many military applications, especially those that are governed by linear, objective and causal relationships. For example, the rigidity of doctrine and traditional planning methods create many preconditions necessary to quickly cycle through an OODA loop.[19] Furthermore, in an Air Force context, the task of preparedness (including force generation) accords to a linear relationship. *Strategy* is able to be distilled to *ends,*[20] which can be linked to *ways* (i.e. preparedness and force generation directives) and *means* (i.e. force generation plans, objectives and activities) in a highly linear and systematic manner. Planners within Air Command's preparedness realm actively engage with functionalist and rational approaches that add predictability, measurability and repeatability to their processes. This is not to say that the task of preparedness design and management is simple—it is in fact a complicated beast. Rather, it is to demonstrate that there is still relevance and a strong need for scientific and functional approaches to strategy within a contemporary Air Force.

However, there are also areas where the paradigm of functionalist strategy offers reduced utility. This occurs when subjectivity and non-linearity are required to understand a particular reality. This applies when dealing with complexity, where no proportionality exists between cause and effect, elements of ambiguity and surprise are defining characterises of a context, and where future-states cannot be reasonably explained by past knowledge.[21] Within these contexts, 'even the notion of a military 'goal' or strategic 'end-state' becomes paradoxical or non-existent when we consider the non-linear and emergent process of systemic change and innovation'.[22] These circumstances make for an accurate representation of the context that the Air Force is facing. Dealing with this context requires a shift away from functionalist paradigms to new emergent paradigms of strategy (such as interpretivist strategy)[23] that allow for more fluid, context-based and dynamic approaches to military strategy geared for 'learning in motion'.[24]

This approach to understanding strategy does not require an either/or selection process between paradigms—both functionalist and interpretivist paradigms have utility in different contexts. It is instead necessary to find ways of reconciling the differences between the two and to understanding *when* to use a certain paradigm. This is especially important for the Air Force where there is a need to shift towards interpretivism for some of the ways it considers strategy, force design, and capability development, and towards greater functionalism for elements of capability and preparedness. The integrated, interdependent and increasingly dynamic nature of Air Forces' strategy, capability and preparedness systems (of systems) requires the ability to break out of the trappings of a single paradigmatic approach and 'blend' otherwise opposing paradigms.[25] The tension that exists within this union must be understood and embraced.

The need for design and new sensemaking

Air Force's requirement to simultaneously (1) identify and exploit new capabilities to deliver relevant air power effects, and (2) reimagine the interplay between capability development, competitive advantage, and strategy is steeped in non-linearity, creativity, and complexity. Dealing with these characteristics requires ways to make sense of the unknowable.

Edgar Morin, a French philosopher internationally recognised for his work on complex thought, outlined two predominant perspectives on complexity: restricted and general complexity.[26] The main difference between these two perspectives is that restricted complexity contemplates the exploration of multiple, interrelated processes that constitute complex systems to retroactively uncover the constituent elements that make up their complexity. In contrast, general complexity posits a view that it is impossible to construe the constituent parts of complexity by any means of reduction—*'one cannot simply "cut-up" complex systems in order to understand them, since what is of interest is the dynamic, local interrelations that exist between the parts of a complex system'.*[27] Regardless of whether one chooses to view complexity in restrictive or general terms, what is certain is that engaging with, and in, complexity and all its ambiguity has the potential to offer Air Force a significant warfighting advantage against an adversary who may have attained technological or tactical parity but is someway from achieving parity in the cognition of complexity.

There are number of different modes of thinking and operating that enable one to engage with complexity to a point where the possible range of solutions may be shifted from *unknowable* to *restrictedly knowable*. Design thinking is an effective vehicle to deal with complex problems in this manner. It does this by enabling effective *sensemaking* that aids in the navigation of complexity, particularly by facilitating the point of view of the end-user and the understanding of many different core and peripheral perspectives. For decades, design has been widely used as an innovative tool for organisations to remain competitive in an ever-increasing global economic environment. This approach is more commonly known as design-driven innovation.[28]

While design has often been associated with the successful development of new products and services, recent studies have demonstrated that design goes beyond the development of new products. Design is capable of playing a more pivotal role in building the strategic capabilities of an organisation and contributing to their core business values.[29] The key to competitiveness in today's global economy is for organisations to have well-designed strategies supported by deliberately designed organisations. In this ecology, sensemakers perform a critical function in reconciling top-down strategy to meet bottom-up creativity and innovation. This in turn is shown to give rise to new knowledge, new innovations, new paradigms, new designs and finally new capabilities. This draws strong parallels with an Air Force seeking to make sense of the complexity that lies before it.

This need for new sensemaking is unpacked in an Air Force context in the recent special report developed by the Australian Strategic Policy Institute (ASPI)—*Projecting Australian Air Power Strategy for an Age of High Contest*.[30] This report advances a shift in how Australian air power strategy might be conceived by moving away from a static capability or platform-based approach and towards a more dynamic *effects-based* approach. While the ASPI report provides non-binding public policy advice (and therefore does not prescribe how the Air Force will shift its

approach to strategy), the author of the report, Peter Hunter, who is the current RAAF Director of Air Force Strategy, is tasked with developing the next iteration of Air Force strategy to guide the Air Force into the future. It is therefore reasonable to expect that many of the conceptual underpinnings of the ASPI report may inform how Air Force shifts its strategic understanding and orientation into the future.

Hunter cites the need for the Air Force to adopt a new 'small, smart and many' approach to technology acquisition and deployment (compared to the current 'few, expensive, exquisite approach) coupled with a more agile approach to the integration of systems and capabilities.[31] The report also implies that an effects-based approach to Australian air power strategy would involve a more abductive relationship between innovative capability development and disruptive strategic realisation (and the two-way non-linear interplay that would exist between these domains). Neither top-down deductive models (where strategy is the exclusive determinant of how capability is developed) *nor* inductive approaches (where the capabilities of individual platforms define the kinds of effects they can or should generate) offer sufficient utility on their own.[32] Rather an abductive approach is required to take the best from both approaches. Hunter advocates the role for design thinking and innovative ideation methods to give substance to more useful Air Force strategies and capabilities.[33]

The ASPI report presents one of the most contemporary and compelling calls to action from outside the Air Force of the need for design, and the intricate way that Air Force needs to consider the role of design as a sensemaking function to help cut through complexity, identify novel solutions and build non-linear relationships between strategy, capability development and the pursuit of disruptive advantages.

The role of design

In previous decades, design has been widely used as a strategic and innovative tool for organisations to remain competitive in complex and globalised markets. Dealing with complexity requires a multidisciplinary approach—design plays a key role by bringing the perspectives of the end user to the forefront of the process to help frame problems and identify. Design employs a user-centric approach to problem solving that ensures the end user is in kept in mind from the very beginning of the design development of a product, system or service; that it can be adopted into the organisation; and that it is actually solving the problem at hand. Design allows for a magnitude of potential solutions to be developed quickly, prototyped, iterated upon, re-developed and tested again in order to provide users with scientifically sound solutions that address their latent needs.

One of the defining characteristics of the design thinking approach is the non-linearity of the process. Solutions are sought through an iterative process of discovering and identifying the problem, creating a solution, prototyping and then evaluating the feedback. This approach avoids the trap of investing too many resources too early in a project towards developing a specific single solution. Design innovation extends the reach of design thinking from an organisation's cultural philosophy to an executable, future-driven process with the potential to drive growth and develop future competitive advantage.[34] The design process applies the attributes of design thinking such as provocations to push the limits of knowability, the constructs of strategic alignment through the power of a user-centric why, through to empathy to gain deep insights into the user, their wants and needs.

Design thinking consists of methods to investigate and analyse ill-defined problems leading to proposed solutions.[35] But, there are many variations and uses of 'design' within military planning worldwide and currently there are few if any exhaustive summaries of military design movements or studies of design theory beyond a single service or doctrine.[36] The lack of comparative analysis of military design may contribute to this lack of understanding.

Design thinking provides a methodology to assist organisations with their practices in a more accurate and reliable fashion.[37] The methodology, which traces its early beginnings from architecture to product and industrial design, is now increasingly based on research findings, which to a large extent, influence the practical experiences previously accumulated by organisations. A growing number of modern design thinking initiatives are being applied in defence contexts internationally, stemming principally from the combat-focused Systematic Operational Design Model from the Israeli Defence Force.[38] According to Zweibelson, this model and similar design thinking initiatives have been used in what he refers to as the first-generation military design models since the 1990s.[39] The influence of design thinking methodology in defence projects, specifically within the American Army, is reflected in three major areas including: understanding the operational environment; understanding the problem; and the use of a design concept for the development of solutions.[40] It is recognised that defence planning alone is increasingly unable to satisfy the demands for the eclectic and multi-disciplinary constructs that require critical and creative thinking in areas. This promotes the need for effective procurement and acquisition, as well as operational planning and organisational change. To date, design thinking has been applied mainly as a tool for solving specific complicated or 'knowable' problems on a tactical or operational level.

Despite the growing number of projects seeking to integrate various methods of design thinking into military contexts, there still remains an uncomfortable fit.[41] Military organisations and their composition of education and training have traditionally excelled at equipping people to deal with left to right or deductive thinking. That is, problems are viewed from a known position and are reduced to manageable parcels of complexity; solutions are then explored from these known positions. Such thinking works well when the answer is knowable and is contained within a closed universe of possible solutions. Flying an aircraft, fixing a faulty piece of technology or building a bridge, while extremely complicated, are not complex and fall into this category of thinking. However, the fifth-generation future that the Air Force aspires to will be characterised by increasingly complex problems where the answer is unknowable, and only makes itself visible after much experimentation and 'prototyping for understanding'.

Frustratingly, once discovered, these dynamic complexities can very quickly change form yet again. Challenges such as multi-domain command and control, the integration of the space and cyber domains with the physical domain, or understanding China's strategic world view and consequential actions, or the causes of global human displacement are complex. While it is easy and seductive to accept the reductive, simpler and often binary expositions of solutions, such challenges require considered right to left thinking based on abductive reasoning.

Designers exercise an 'open' and complex productive reasoning pattern of abduction, focused on the end-value to be achieved without knowing how to achieve it.[42] Philosopher, Charles Sanders Peirce (1839-1941) first proposed the method of abductive reasoning, which begins with a hypothesis to explain what is going on with

a surprising, novel or puzzling phenomenon. Unlike detailed military planning, design as a practice brings with it eclectic combinations of philosophy, social sciences, complexity theory, and often improvised, unscripted approaches in a tailored or 'one of a kind' practice.[43] Ultimately, this manner of reasoning is often anathema to most military minds that are educated, trained, valued and rewarded for speed of decision to action, and are often seen as time consuming and overly esoteric. For this reason, there is a tendency within military applications of design thinking to apply methods in a manner that work to simply *reinterpret* traditional military planning processes through 'selecting element of design without disrupting the deeper epistemological structures' at play.[44]

Jericho and Air Force design

Plan Jericho was established in 2015 to realise the RAAF's fifth-generation ambition. Since this establishment, it has focused on harnessing the combat potential of the integrated and joint force, changing the way the Air Force acquires and sustains capability, and developing an empowered and innovative workforce. Plan Jericho is deliberately structured to reside outside of Air Force's business as usual running system, with its own funding sources and ability to bypass traditional military hierarchies and chains of command. Plan Jericho continues to leverage profound structural and operational advantage to act as a catalyst to support the whole of the Air Force and arguably the wider Australian Defence Organisation, including defence industry and academia to build a future force that is agile and adaptive, and fully immersed in the information age.

In 2019, Plan Jericho recognised that in order to address the unprecedented and complex problems of the future, a sole focus on the integration of the future force was insufficient. As a consequence, Plan Jericho moved to an implementation model based on 'The Edge' strategy, realising that disruption and the potential of the Air Force lies at and beyond its fifth-generation edges. Plan Jericho recognises that the future challenges will likely be defined by an acceleration of warfare's tempo where small advantages will be decisive and competition will be constant.[45] Rising to this challenge, Plan Jericho is advancing a new Augmented Intelligence to guide how the Air Force should fuse human creativity and flexibility with the precision, tempo and mass of machine processing. The efficacy of the Augment Intelligence concept hinges on the Air Force's ability to leverage human-machine augmentation to cognitively overwhelm its competitors by posing human-inspired dilemmas at machine tempo across multiple domains.[46]

Despite this recent evolution, three guiding principles continue to shape the implementation of Plan Jericho:

1. combining top-down design with bottom-up innovation

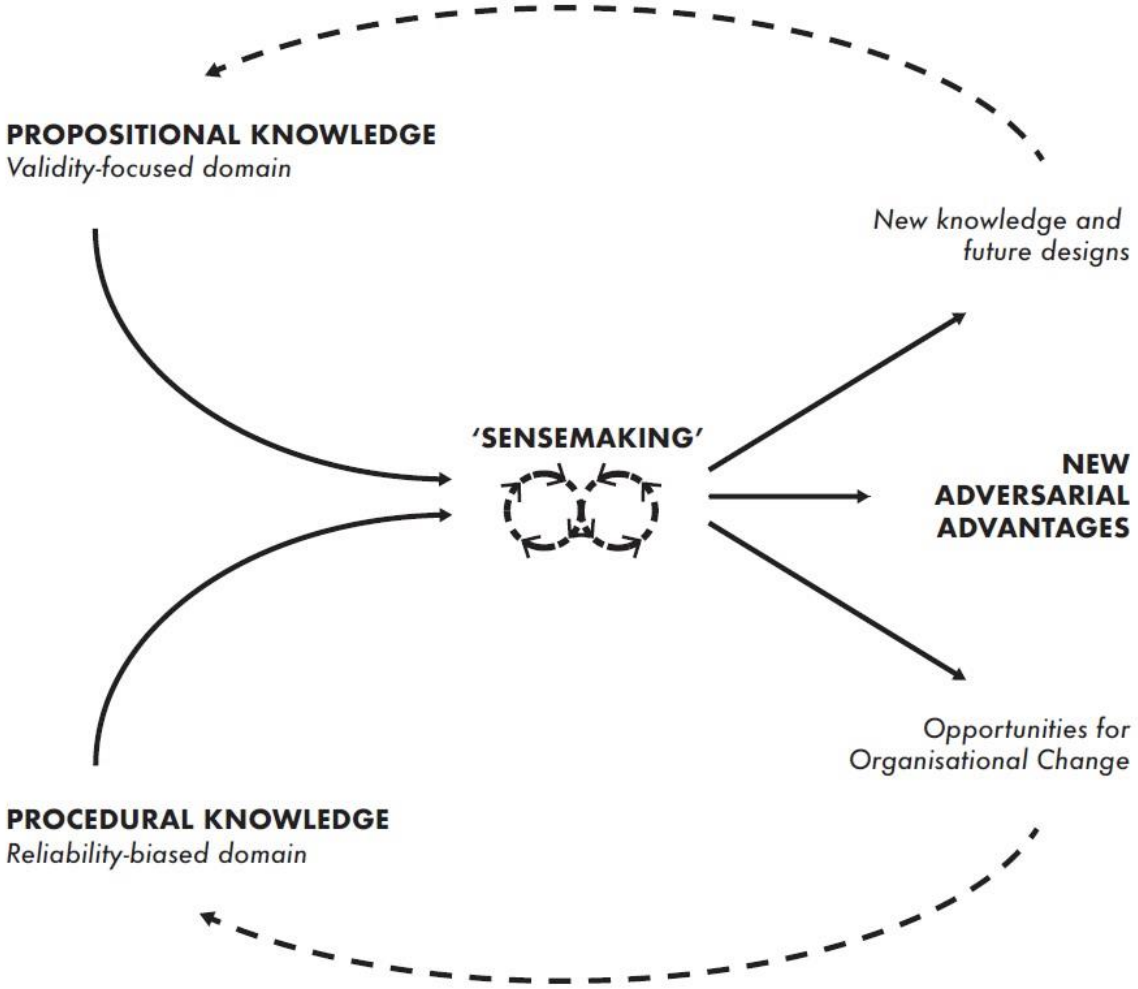
2. adopting a 'compass approach', which requires strategic planning and oversight as well as flexibility and a culture that values innovative thought

3. organisational change that is focused on integrated and joint combat effects and missions.[47]

The unpredictability of Air Force's future contests necessitates a need for the Air Force to better engage with risk and failure as a means to navigate ambiguity. In response, Plan Jericho has developed a bespoke sensemaking model. This model

offers new explanatory power for how the Air Force can transform knowledge into adversarial advantages (depicted below in Figure 3.1).[48] This sensemaking model exploits the value of design to assign meaning to novel issues or events, and connects the worlds of propositional and academic expertise with the practical expertise of the end user. Doing so, allows for proven methods to be applied to complex problems, to be developed into new knowledge, opportunities for organisational change and ultimately adversarial advantages.

Figure 3.1: Plan Jericho Sensemaking Model



Leaning into constant contest: Fifth-generation Transient Capability Advantage

> *Where once it was possible for the ADF and Australia's allies and partners to achieve enduring capability overmatch, that's no longer the case. The phenomenon of 'transient advantage' means competitors can so quickly acquire and adopt peer-level systems that any advantage we might gain will only be temporary at best. With open global markets, including in the technology sector, those technologies will be 'user-agnostic'. Moreover, weaknesses in intellectual property law and other protections means that [Australia's] ability to keep technical superiority for [itself] is declining.*[49]

This phenomenon of transient advantage makes for a considered shift to the dynamics in the Air Force's external environment. In this reality, any assumption of sustained and persistent military advantage by any one actor is an arrogant and potentially fatal folly. During the period 2016–2017, the Air Force—under the auspices of Plan Jericho—worked to reframe the phenomenon of transient advantage in a way that better allowed for exploitation by the Air Force, in order to generate disruptive effects and underpin the decisive *adversarial* advantages that the organisation is seeking to create.

Transient Capability Advantage (TCA) was the concept developed by Plan Jericho to help contextualise and situate the problem that 'sustainable competitive advantage, in either commercial or warfighting endeavours, is now the exception and not the rule. Transient advantage is now the new normal'.[50] The TCA concept draws from the wider and general phenomenon of transient advantage but applies an explicit 'capability frame' to give the concept greater relevance and descriptive power to the Air Force and the domain of air power professionals. This is to say that the kind of adversarial advantages the Air Force will be required to pursue in its new context will be based heavily on disruptive warfighting capabilities, and the link these capabilities have with dynamic strategies.

Air Force's TCA concept refers to how new knowledge and capability artefacts from technical to conceptual solutions can be developed using design methodologies to rapidly identify and transition science and technology into novel—even if transient—capability advantages in warfare. To fight and win in the future, the Air Force needs to excel at exploiting and integrating transient capability advantages faster than its adversaries.

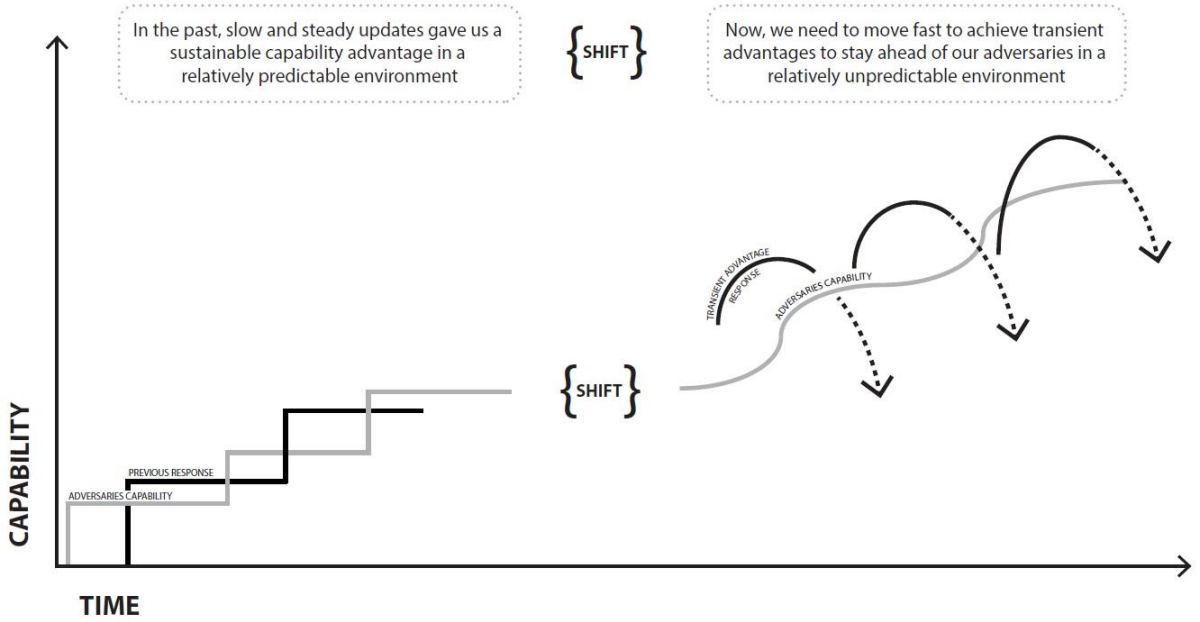
The proposition at the core of the TCA concept compels the Air Force to consider developing a system of TCAs *alongside* traditional sustained capability advantages, such as major air power platforms and weapon systems. The simple contention is that these two elements of air power residing side-by-side and employed judiciously within in an integrated multi-domain construct will allow the expert holder of such a system to cycle through Boyd's OODA loop faster than the adversary. Doing so allows for the creation of an asymmetric, albeit transient, capability advantage by presenting the adversary with a continuous cycle of novel dilemmas resulting in a defeat calculus that acts at the level of both their decision cycle and the limits of the characteristics of their capabilities.

Figure 3.2 depicts a capability pathway model with two contrasting approaches. On the left-hand-side, the figure illustrates the gaining of, sustainment and then evolution of traditional long lead-time capability advantages that provide sustained overmatch in comparison to an adversary. On the right-hand-side, the figure illustrates the TCA concept; the rate of advancement of potential adversaries' capability (red line), based on current global realities, which can only be overmatched for fleeting or transient, periods with short-lived capability advantages. The proposition alluded to by this comparison is that Air Force needs to re-think its approach to generating air power based on sustainable capability advantage to a portfolio TCA approach based on the combination of both sustained and transient capability advantages.

Breathing life into the TCA concept will require a significant shift in thinking for the Air Force. Previous approaches to capability (including Capability Life Cycle processes) have seen Air Force respond to external contexts with slow and steady programs of *modernisation by replacement* to develop a sustainable advantage in a relatively

predictable environment. However, as the Air Force's adversaries continuously improve and develop new technology, there is a need to build, test and prove a TCA framework to allow Air Force to move more quickly to achieve transient capability advantages. It will be critical for the Air Force to continuously identify and deliver against the next source of transient advantage to maintain asymmetries. Indeed, it could be argued that at a more macro-level, the true advantage that Air Force would gain through the adoption of the TCA concept is not afforded by any discrete TCA, but rather it gains from Air Force's ability to have a system that can generate and integrate capability advantages more rapidly and consistently than its adversaries.

Figure 3.2: Integrated Model for Transient Capability Advantage



The base concepts underpinning the TCA concept are not particularly new. The concept has its origins in the same assumption that underlies the US 3rd Offset Strategy.[51] This strategy relates to the need to constantly develop flexible and dynamic capabilities that provide at least short-lived advantages over potential adversaries.

Significantly, the Air Force's conceptual and theoretical grounding for TCA is based on the concept of arbitrage. 'Arbitrage' is an economic concept that serves as a simple yet powerful way to understand this transient warfighting capability advantage, especially as it applies to the *Air Force Strategy: 2027*,[52] *Plan Jericho*,[53] and emergent ideas about future Australian air power strategy.[54] Arbitrage means to capitalise during a state of imbalance between two or more financial markets to take advantage of a price or value imbalance. In the past, an arbitrage advantage could last several minutes before the technologies of the time such as phones and faxes caught up to it. Today, given the advances in information technologies, and the democratisation of knowledge leading to the open availability of information, an arbitrage advantage may only last a few seconds or less. It follows that those best able to profit from it must quickly identify the opportunity, rapidly acquire the knowledge and capacity to integrate it, and then exploit it without delay. The combination of features required for arbitrage advantage in modern markets is emblematic of the features that fifth-generation capabilities may provide to a modern air force. Rising to this challenge, Plan Jericho has been working towards building the networks, methodologies, skills, knowledge and attributes required for the foundations upon which to build a TCA framework.

As has been explored, navigating a context characterised by non-linearity and complexity requires the specialist skill-set of sensemakers to identify and exploit opportunities and drive change. For this reason, this key function lies at the centre of the design of a TCA framework and plays a central role in realising dynamic strategy. The utilisation of design thinking in the Air Force allows for the opportunity to develop this niche sensemaker skillset and propagate the behaviours and thinking that support its efficacy. Plan Jericho and its proponents have often needed to act as sensemakers or catalysts to assist disruptive ideas with potential for warfighting capability advantage take hold and grow roots. This is often done by establishing authentic relationships with a network of actors based on a high degree of trust, empathy, expert knowledge, credibility and professionalism. This foundation of authenticity is then leveraged to connect the problem with the potential solutions to drive transformation. Wrigley describes the comparable role of the Design Innovation Catalyst (DIC) as being to 'translate and facilitate design observation, insight, meaning and strategy for all facets of the organisation'.[55] The value of a design innovation catalyst to an organisation is crucial and a major component of their catalytic role is regular interaction with learning-teaching facilitators and industry-academia.

The DIC developed by Wrigley proposes a model to engage DICs to drive innovation and capability within organisations be adopted and applied to the design of the Air Force TCA framework.[56] Wrigley defines the four stages of the DIC Framework. The first stage is the *Absorb stage* referring to the DIC discovering knowledge and theory, critiquing and questioning existing research, case studies and business models within a learning environment. Following this, DICs *Investigate* within their current organisation and gather insights and information for their current project within the organisation. From there, DICs *Challenge* current ways of working within the organisation, generate discussion, debate and tensions to challenge and explore new possibilities. Results from the DIC efforts occur when the findings of the project are *Disseminated* and contribute to capability.

The proposed TCA framework draws its final conceptual underpinning from Boyd's OODA loop to establish five distinct and iterative phases of transient capability generation.[57] As has been explored, the linkage with the OODA framework holds a particular relevance in aligning Air Forces efforts to consider non-linear approaches to strategy design and operational artistry that offer utility in a digital, contested and complex age. OODA is a well-tested, design-based heuristic that is well suited for transitioning a framework into a useful heuristic for learning.[58]

The five iterative phases of the TCA framework are: identify, translate, exploit, reconfigure and decommission. A summary of each of these phases is provided below:

Identify the opportunity (or potential opportunity) and mobilise sufficient resources to capitalise on it. This requires a disciplined and deliberated process of strategic assessment that seeks to identify critical capability gaps that are tightly aligned to the strategic objectives.

Translate the research and/or technology to a usable Minimum Viable Product capability by mobilising the Air Force innovation ecosystem (Defence, industry and academia). This requires the sensemaker(s) to leverage their knowledge networks, both propositional and procedural, to translate the needs of the end user to the makers to commence the process of prototyping for understanding.

Exploit, experiment, test and prove Tactics, Techniques and Procedures required to mobilise the arbitrage either immediately or at a time and place of choosing. Exploitation is achieved when the TCA has been fully integrated into a usable capability and is ready to be deployed to generate warfighting effects.

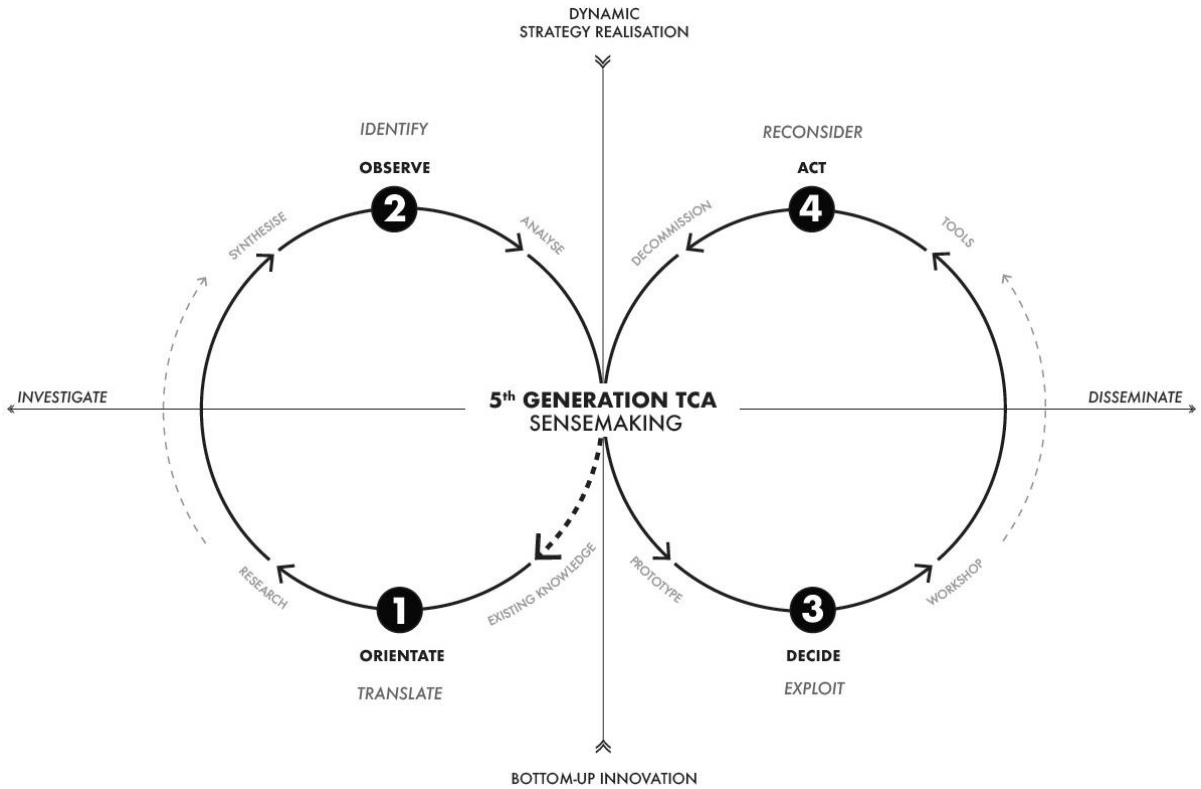
Reconfigure the arbitrage to extend its advantage to something novel. This a crucial step where the TCA is either repurposed or adapted for new uses cases.

Decommission if the arbitrage cannot be further reconfigured it should be declared obsolete and decommissioned.

By combining these features, Air Force have been able to develop an integrated model with design-led sensemaking at its core.[59] This model remains conceptual, but it is currently being tested, evaluated and refined through practical application and applied research initiatives.[60]

This emergent TCA framework aims to provide a model that could design and integrate TCAs faster than Air Force's adversaries can. To develop a TCA, as shown in Figure 3.3, two axes must cross: 'investigate—disseminate' and 'dynamic strategy realisation—bottom-up innovation'. Importantly, at the intersection of these axis must lie deliberate sensemaking. The TCA framework highlights identifying and observing capability gaps or opportunities within Defence and strategic contexts (top-left quadrant) and orientating and translating those opportunities into capability (bottom-left quadrant). This capability is then exploited in a manner that is geared to provide a disruptive capability advantage in Air Force's external context and disseminated (top-right quadrant), then it is reconfigured in academia or industry to extend its advantage, which is then decommissioned once obsolete, with the process commencing another iterative cycle.

Figure 3.3: Fifth-generation Transient Capability Advantage (TCA) Framework



The cornerstone of success for the Air Force using the TCA framework to achieve dynamic strategy realisation is centred on ‘capacity’ and ‘speed’. That is, being able to have a proven capacity that allows the Air Force to identify leading research or opportunities, turn it into usable capability, develop the capability into a warfighting concept, deploy it, exploit its temporal advantage and then be able to do it all over again. The capacity to do this constantly, and at speed, will afford an unassailable strategic advantage. Fast moving arbitrage requires the Air Force to be adept at achieving the TCA cycle at increasing levels of speed and sophisticated capacity.[61]

Summary, implications and future work

The challenges the Air Force faces have necessitated non-traditional, abstracted and design-based thinking about how new advantages can be generated and leveraged. However, this turn towards design methods and cognitive tools does not represent an end state, it is just the beginning. The need for non-linear approaches to address complex problems; the requirement for the Air Force to break-out of the trappings of a single paradigmatic approach to understanding strategy, capability and advantage and ‘blending’ otherwise opposing paradigms; and the need to adopt a new approach to fifth-generation sensemaking that builds better abductive relationships between innovative capability development and disruptive strategic realisation remain unprecedented issues for the Air Force.

From the concepts explained above a plethora of future work is needed to explore and validate the ideas presented in this chapter. Specifically, there is a need to test, validate and redesign many of the theoretical and practical underpinnings of the Air Force’s TCA framework. This process of testing and validation needs to be guided by three broad lines of enquiry. The first is the need to understand how well the TCA framework builds inductive, bottom-up capabilities from within the Air Force, or from academic or industry partners. Second, the abductive sensemaking component, which is central to the TCA concept, needs to be explored in practice and how it would actually work in an Air Force context understood. Finally, the TCA framework will require establishing new types of relationships with the realm of strategy, where a two-way dynamic is developed (with emergent capabilities shaping strategies and strategies shaping emergent capabilities). To unpack these lines of enquiry, the authors propose three foundational research focus areas that require investigation.

First, there is a need to better explore how the Air Force can develop and exploit high-end science and new technologies. The Air Force is at the cutting edge of technology; however, new technologies will require unorthodox and highly original thinking. This provides a unique opportunity to disrupt current ways of working to turn high-end science into advantageous Defence capability. As design thinking is a systematic and collaborative approach for identifying and creatively solving problems, it is useful in markets that are quickly changing or where user needs are uncertain. This provides the following research questions to explore:

- How can design and high-end science fit together to design and prototype capability enhancements to counter adversary combat technologies in problem domains where unpredictability is inherent?
- What is the role of design in developing high-end science capability through prototypes taxonomies with the end user in mind?

- Do the range of scientific discoveries in the realms of SPAD, nanoscience, quantum computing, artificial intelligence and medical countermeasures vary in design approach?

- How can we design a sustained pathway for the Air Force to transform in the information age?

Second, the efficacy of the TCA framework lies in the ability to abductively link new and emergent concepts and technology, with dynamic strategy realisation (recognising that both elements will influence each other) through a process of sensemaking. The ability to create this abductive link in a meaningful way hinges on developing capabilities that can *actually* be applied for a disruptive effect to generate a transient advantage. If this cannot be achieved, there is a real risk that the Air Force will be unable to escape a rationalist trap. It would see the Air Force focus exclusively on the way it moves its chess pieces, without examining the game of chess at the metalevel. To overcome this, a very unique approach of sensemaking is required. We need to better understand how new approaches to sensemaking can be applied at the meso-level (operational and campaign design as distinct but interrelating processes), as well as at the macro-level (to the design of objective and future forces) and the development of air power strategy. This gives rise to the following research questions:

- What approaches to sensemaking are necessary to allow the Air Force to realise dynamic disruptive strategies and exploit capability advantages? How might this approach to sensemaking differ when integrated with established ecologies of operational design, campaign design, and force design?

- How can the Air Force exploit disruptive capability advantages as a consequence of fifth generation sensemaking within the TCA framework?

- How would a more interpretivist approach to strategy and force design be developed for the Air Force and how would this different paradigm be reconciled or ‘blended’ with the dominant functionalist paradigms the Air Force uses to underpin its capability and preparedness systems?

Thirdly, there is a need to better develop and test the TCA framework to understand how design capability should be built within the Air Force. Education plays a critical role in developing capability within individuals to enable cultural change and embed capacity within an organisation. Learning design and design thinking requires an understanding of its theoretical concepts, techniques *and* their practical application to real world problems. This requires an integrated approach to design thinking content delivery to build and develop next generation capability within individuals and create a culture of change across the Air Force. The following research questions provide an opportunity to explore:

- How is design knowledge, understanding and capability built within individuals across the Air Force?

- What factors affect the adoption of design thinking?

- How can design thinking help support organisational change and innovation?

In order to explore how successful design is at navigating complexity in these contexts, and enhancing capability across the organisation, focused, sustained and

empirically-minded modes of academic enquiry will be required. Investigating each of these areas to build capability will begin to enable the Air Force to address the challenges that lie ahead in an uncertain future.

Notes

[1] A paradigm is 'a fundamental image of the subject matter within a science that serves to define what should be studied, what questions should be asked, how they should be asked, and what rules should be followed in interpreting the answers obtained'. For further discussion, see: Thomas Kuhn, *The Structure of Scientific Revolutions*, 3rd ed. (Chicago: University of Chicago Press, 1996).

[2] Ben Zweibelson, 'Rose-Tinted Lenses: How American Functionalist Strategy Inhibits our Appreciation of Complex Conflicts', *Defence Studies*, Vol. 16, No. 1 (2016), pp. 68–88.

[3] It is acknowledged that within an Australian Defence Force context, the term 'capability' has an assigned definition and meaning as 'the power to achieve a desired operational effect in a nominated environment within a specified time and to sustain that effect for a designated period' (Department of Defence, Australian Defence Doctrine Publication (ADDP) 00.2—*Preparedness and Mobilisation* (Canberra: Defence Publishing Service, 2013), p. 3.3). The authors utilise the term capability with an awareness of this context, but use the term with a strong emphasis on contemporary approaches to capability development as but one of many interrelated aspects within the Air Force's Capability Lifecycle Management System.

[4] Peter Hunter, *Projecting National Power: Reconceiving Australian Air Power Strategy for an Age of High Contest* (Canberra: Australian Strategic Policy Institute, 2019), p. 8.

[5] Peter hunter, 'More of the same isn't the answer to Australia's Security Challenges', *The Strategist* (blog), Australian Strategic Policy Institute, 7 August 2019. Online: https://www.aspistrategist.org.au/more-of-the-same-isnt-the-answer-to-australias-security-challenges/, accessed 26 August 2019.

[6] Hunter, *Projecting National Power,* p. 9.

[7] *Functionalist strategies* in this sense refers to the dominant paradigm of western military strategy, international relations theory and to a wider extent, sociology which are underpinned by rationalist and positivist philosophies. These philosphies seek to explain the actions of the social world through the adoptation of methodologies of natural sciences and have been generally discredited for their role in 'stifling debate over what the world is like and how we might explain it'. Steve Smith, Ken Booth & Marysia Zalewski, *International Theory: Positivism and Beyond* (Cambridge: Cambridge University Press, 1996), p. 11.

[8] Zweibelson, 'Rose-Tinted Lenses', p. 70.

[9] Royal Australian Air Force (RAAF), *Air Force Strategy: 2027* (Canberra: Defence Publishing Service, 2017).

[10] Hunter, *Projecting National Power*, p. 6.

[11] The Sir Richard Williams Foundation, 'Call for Submissions – The Requirements of Fifth Generation Manoeuvre', *The Central Blue* (blog), 28 July 2019. Online: http://centralblue.williamsfoundation.org.au/call-for-submissions-the-requirements-of-fifth-generation-manoeuvre-5thgenmanoeuvre/, accessed 26 August 2019.

[12] The metaphor of the chess game draws inspiration from that developed in: Ben Zweibelson, 'Seven Design Theory Considerations', *Military Review*, Vol. 92, No. 6 (2012), pp. 80-89.

[13] Genevieve Bell, 'Fast, Smart and Connected: What is it to be Human, and Australian, in a Digital World', *Boyer Lecture Series* (Australian Broadcasting Corporation, 2017). Online: https://www.abc.net.au/radionational/programs/boyerlectures/series/2017-boyer-lectures/8869370, accessed 26 August 2019.

[14] James Jasper, *Getting Your Way: Strategic Dilemmas in the Real World* (Chicago: University of Chicago Press, 2006); Aidan McGarry, Robert J. Davidson, Guya Accornero, James M. Jasper & Jan Willem Duyvendak, 'Players and Arenas: Strategic Interactionism in Social Movements Studies', *Social Movement Studies*, Vol. 15, No. 6 (2016), pp. 634-642; Philip Balsiger, 'Corporations as Players and Arenas' in: James Jasper & Jan Willem Duyvendak, Eds., *Players and Arenas: The Interactive Dynamics of Protest* (Amsterdam: Amsterdam University Press, 2014), pp. 119-140.

[15] Hunter, *Projecting National Power*, p. 19.

[16] Aaron P. Jackson, 'A Brief History of Military Design Thinking', *Medium* (blog), 6 February 2019. Online: https://medium.com/@aaronpjackson/a-brief-history-of-military-design-thinking-b27ba9571b89, accessed 26 August 2019.

[17] Zweibelson, 'Rose-Tinted Lenses', pp. 68–88.

[18] Ben Zweibelson, 'One Piece at a Time: Why Linear Planning and Institutionalisms Promote Military Campaign Failures', *Defence Studies*, Vol. 15, No. 4 (2015), pp. 360-374.

[19] Ofra Gracier, '"Beware the Power of the Dark Side": The Inevitable Coupling of Doctrine and Design', *Expertica Militar*, October 2017, pp. 30–37.

[20] For example, the ends articulated in Defence Planning Guidance (specifically, Strategic Response Options), Australian Military Strategy, Chief of the Defence Force's Preparedness Directive, and the Quarterly Strategic Review.

[21] Zweibelson, 'Rose-Tinted Lenses', pp. 75–76.

[22] Ben Zweibelson, 'The Multidisciplinary Design Movement: A Frame for Realizing Industry, Security, and Academia Interplay', *Small Wars Journal*, 10 January 2019. Online: https://smallwarsjournal.com/jrnl/art/multidisciplinary-design-movement-frame-realizing-industry-security-and-academia-interplay#_edn15, accessed 11 January 2019.

[23] Zweibelson, 'Rose-Tinted Lenses', pp. 68-88.

[24] Gracier, '"Beware the Power of the Dark Side"'.

[25] Zweibelson, 'Rose-Tinted Lenses', pp. 68–88.

[26] Edgar Morin, 'Restricted Complexity, General Complexity' in: Carlos Gershenson, Diederik Aerts & Bruce Edmonds (Eds.), *Worldviews, Science and Us: Philosophy and Complexity* (London: World Scientific Publishing Co., 2007), pp. 5–29.

[27] Minka Woermann, *On the (Im)Possibility of Business Ethics: Critical Complexity, Deconstruction, and Implications for Understanding the Ethics of Business* (New York: Springer, 2013), p. 34.

[28] Roberto Verganti, *Design-driven Innovation: Changing the Rules of Competition by Radically Innovating What Things Mean* (Boston, MA: Harvard Business Press, 2009).

[29] Tim Brown, *Change by Design* (New York: Harper Collins, 2008); Roger Martin, *The Design of Business* (Boston: Harvard Business Press, 2009).

[30] Hunter, *Projecting National Power*.

[31] Hunter, *Projecting National Power*, p. 21.

[32] Hunter, *Projecting National Power*, p. 14.

[33] Hunter, *Projecting National Power*, p. 21.

[34] Sam Bucolo & Cara Wrigley, 'Design-led Innovation: Overcoming Challenges to Designing Competitiveness to Succeed in High Cost Environments' in: Göran Roos & Narelle Kennedy (Eds.), *Global Perspectives on Achieving Success in High and Low Cost Operating Environments* (Oxon: IGI Global, 2014), pp. 241–251.

[35] Karla Straker, 'Defence by Design: Redesigning the Acquisition Process for the Royal Australian Air Force', *Journal of Design, Business and Society*, Vol. 3, No. 2 (2017), pp. 145–166.

[36] Ben Zweibelson, 'An Application of Theory: Second Generation Military Design on the Horizon', *Small Wars Journal*, 19 February 2017. Online: http://smallwarsjournal.com/jrnl/art/an-application-of-theory-second-generation-military-design-on-the-horizon, accessed 12 November 2018.

[37] Stefan J. Banach & Alex Ryan, 'The Art of Design: A Design Methodology', *Military Review*, March–April 2009, pp. 105–115.

[38] Gracier, '"Beware the Power of the Dark Side"'.

[39] Zweibelson, 'An Application of Theory'.

[40] School of Advanced Military Studies, *Art of Design: Student Text, Version 2.0* (Fort Leavenworth: US Army School of Advanced Military Studies, 2010).

[41] Ben Zweibelson, 'An Awkward Tango: Pairing Traditional Military Planning to Design and Why It Currently Fails to Work', *Journal of Military and Strategic Studies*, Vol. 16, No. 1 (2015), pp. 11–41.

[42] Kees Dorst, *Frame Innovation: Create New Thinking by Design* (Cambridge, MA: MIT Press, 2015).

[43] Zweibelson, 'An Awkward Tango', p. 12.

[44] Zweibelson, 'The Multidisciplinary Design Movement'.

[45] RAAF, *At the Edge: Exploring and Exploiting our Fifth-Generation Edges*, 2019. Online: http://view.publitas.com/jericho/fifth-generation-edges/page/1, accessed 27 August 2019.

[46] RAAF, *At the Edge*, p. 3.

[47] RAAF, *Plan Jericho Program of Work 2016: Transforming Air Force's Combat Capability*, 2nd ed. (Canberra: Air Power Development Centre, 2018).

[48] Tony Watson, 'Rhetoric, Discourse and Argument in Organisational Sense Making: A Reflexive Tale', *Organisational Studies*, Vol. 16, No. 5 (1995), pp. 805–821.

[49] Hunter, *Projecting National Power*, p. 21.

[50] Rita Gunther McGrath, 'Transient Advantage', *Harvard Business Review*, June 2013. Online: https://hbr.org/2013/06/transient-advantage, accessed 27 August 2019.

[51] Graham Warwick, 'Pentagon "Wide Open" to Ideas for Third Offset Strategy', A*viation Weekly*, 3 December 2014; Phil Arms, 'The U.S. 3rd Offset Strategy: An Opportunity for the ADF', *Australian Army Land Power Forum* (blog), 28 July 2016. Online: https://www.army.gov.au/our-future/blog/strategy/the-us-3rd-offset-strategy-an-opportunity-for-the-adf?page=2, accessed 27 August 2019.

[52] RAAF, *Air Force Strategy.*

[53] RAAF, *At the Edge.*

[54] Hunter, *Projecting National Power.*

[55] Cara Wrigley, 'Design Innovation Catalysts: Education and Impact', *She Ji: The Journal of Design, Economics and Innovation*, Vol. 2, No. 2 (2016), pp. 148–165.

[56] Cara Wrigley, 'Educating the "Design Innovation Catalyst" for Change' in: Kazuo Sugiyama (Ed.), *Consilience and Innovation in Design: Proceedings and Program, Volume 1* (Toke, Japan: Shibaura Institute of Technology, 2013), pp. 3547–3557; Wrigley 'Design Innovation Catalysts', pp. 148–165.

[57] Jackson, 'A Brief History of Military Design Thinking'.

[58] Zweibelson, 'An Application of Theory'.

[59] RAAF, *At the Edge*.

[60] Examples include research collaborations with the University of Sydney Jericho Lab and Jericho Smart Sensing Lab.

[61] McGrath, 'Transient Advantage'.