DEFENCE FORCE JOURNAL

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Contents

3 Editor's Comment
4 Letters to the Editor
6 The Bi-mobile Force
   Lieutenant Colonel S. Krasnoff, psc and Captain W. W. Houston
16 Marine Science for Defence
   Mr H. A. d'Assumpcao, B.E.(Elec)(Hons), M.E.
22 Army Study of Officer Development
23 The Cotton Aerodynamic Anti-G Suit
   Group Captain M. deL. Faunce, OBE, FRCP, FRACP
29 Chaytor's Force. A Personal Account
   Major General Ronald Hopkins, CBE, US Legion of Merit, pso
34 Job Satisfaction in a Changing Army
   Major P. R. Hudson
41 Is the RAAF Fulfilling Its Obligations?
   Corporal J. W. Clarkson, RAAF
45 Air Mobility — A Game for 100 or More Players
   Captain M. L. Printy
47 Review Article — The Definitive Clausewitz
   Lieutenant G. J. Pemberton
51 Book Reviews
57 Index 1978

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HMAS Moresby, the RAN’s largest Surveying Ship, 2,340 tonnes. She was launched in September 1963 at the Newcastle State Dockyard, NSW.
ONE of the things an editor most fears in a publication in which he has some interest is an error, either in the printing or, more disastrously, in the matter of presented fact. In the most acute cases, it can lead to severe embarrassment and even to the courts.

Many errors, particularly printing errors, are undetected by the untrained eye. But once one is used to proof-reading, it is rather like a referee being a spectator at a football match, the mistakes stand out so plainly that one's enjoyment of the whole is somewhat marred. All books have errors, some small, some large. I have even seen a printing error in a venerable edition of the Authorised Version of the Bible. Any consolation one might draw from such discoveries is tempered by the real chagrin one feels when the mistake has been within one's own powers to rectify.

Group Captain Isaacs' and Mr John Stackhouse's letters destroy any complacency I might have had for the accuracy of the Defence Force Journal, which I read from cover to cover half a dozen times before publication. It all points to the need for another pair of eyes to check and double-check the typescript—and the facts!

We have been most fortunate in this issue in having the talents of Mr Peter Connor, Graphic Designer in the Directorate of Air Force Safety (p. 45) and Sapper Steve Crowe of the Army Audio-visual Unit (p. 23) available to fill the gap left by Dave Hammond's death. I would like to thank them, and the members of the Printing, Reproduction and Graphics Section, Administrative Services Branch, who produced the organisation spiders for the article “The Bi-mobile Force”.

I have just received a letter from Major J. V. Johnson, Officer Commanding 3 Ordnance Services Unit, RAAOC, in Victoria, complaining that the allocation of four copies of the Defence Force Journal is inadequate for the officers and warrant officers in this Army Reserve unit. He also writes that he had not received the questionnaire put out at the beginning of this year. In view of the interest shown in the Journal by this and like units, it is a great pity that somehow distribution falls short of requirements. Journals need to be sent where they are needed while they are still current. It would also cut down the hundreds of “spare” copies which I receive months afterwards. This is an area where much still needs to be done to create a satisfactory situation.

The Board of Management wishes you all a Happy Christmas and a Prosperous New Year.
"THE ARMY — WHAT IS HAPPENING?"

I refer to Flight Lieutenant Foster's letter (DFJ May/June issue No. 10) in which he commented on Warrant Officer Watts' article The Army — What is Happening? I commend both men for their interest in a subject which obviously requires more thought and discussion by all managers, but especially by our middle managers — Senior NCOs and junior officers. In response to Flight Lieutenant Foster's invitation I am presenting my own observations from a junior Naval Officer's point of view.

I believe that all three arms of the service suffer the same problems of declining morale for more or less the same reasons. Whilst procedures differ between each arm of the service I suggest that the basic factors for preserving a high level of morale are twofold.

Motivation of our men is paramount and is best achieved by ensuring they are kept well informed about the objectives of their respective units and by ensuring that their employment is gainful both for them and for the service. Often this becomes extremely difficult — such as in the case of a ship in the throes of a major refit. There junior sailors become little more than painters or cleaners — certainly not what they may have envisaged before they joined the Navy. However, with careful planning and constant contact with their officers and senior NCOs their part in the overall organisation can be made clearer to them.

Just as importantly, loyalty from above completes the process of morale preservation. This, as we all know, is the most important means of ensuring the loyalty of the men whom we lead.

Middle managers must be prepared to support their men as far as is possible within the bounds of correct military discipline. If the Divisional system (as it is known in the Naval sense) or the chain of command are functioning correctly, swift and correct dissemination of information both upwards and down will result and this can only be of benefit to the service as a whole.

I believe that there is a certain amount of relevance in the comparisons which Warrant Officer Watts drew between the soldier of today and of 20 years ago in relation to his standing in the community. This applies equally to the RAN and RAAF. But let us not forget that we are talking about a human factor and I doubt that the degrees of sensitivity or response to proper leadership have altered in 20 years. With the right balance of leadership and discipline men will always respond loyally.

I do not feel that there is cause for alarm at the soldier, sailor or airman of today. If there is an area for concern then perhaps a critical look at ourselves — the managers — is the solution.

Warrant Officer Watts is to be commended for initiating discussion on this subject. I hope that the matter will not stop here and that others will be prompted to add their thoughts.

J. W. Gates

HMAS Melbourne

AIRCRAFT CARRIERS

Lieutenant G. F. McLennan's letter (DFJ No. 11, July/August 1978) on "An Aircraft Carrier for the Royal Australian Navy" shows a certain amount of bias towards his preferred choice of a CTOL carrier. Whilst he quite correctly points out the Melbourne "has the flexibility to adjust her Air Group to meet a variety of operational requirements", he does not attribute this capability to a VSTOL carrier. Any carrier can vary its outfit of aircraft to meet the needs of the day, and with VSTOL, the number of aircraft borne can be increased dramatically if a deck park is utilized as the after end of the flight deck need not be kept clear for wire arresting. A mix of about eight (8) Sea Harriers and eight (8) Sea Kings is a very capable air group and would compare
well with *Melbourne*’s air groups in major exercises over past years. The Sea Harrier is being specifically developed for Air Defence and if it can “hack the shadower” the enemy is denied the location information so necessary for the mounting of a sea or air strike.

I would also disagree with the author’s statement that it is “imperative” that *Melbourne*’s replacement should be a carrier capable of operating both conventional and VSTOL aircraft. It is a very dangerous and no longer acceptable practice to merely renew capital equipment by replacement. All options must be examined in a fresh approach and measured against the requirement, bearing in mind that we cannot always afford a Rolls Royce and sometimes have to make do with a Holden which gets us there but not in such style.

Studies have shown that the minimum size of carrier to operate aircraft such as the S3 and F18 is 35,000 tonnes and this does not include any growth factor for currently projected aircraft. The USN talks of the smallest carrier to take future aircraft being about 60,000 tonnes, so even a 35,000 tonne carrier may end up as a VSTOL-only carrier as a further generation of aircraft would have to be acquired during the ship’s life and these could well be too large for the ship to accommodate.

Of course we cannot expect to obtain a “cheap solution”, but at the same time we cannot expect the government to buy an expensive CTOL carrier when it is less cost-effective, in terms of money, manpower and support, than a VSTOL carrier which meets our requirements. The RN, French Navy, Spanish Navy, Indian Navy, possibly the Italian Navy and Iranian Navy, the Soviet Navy and even the USN have moved or are moving towards VSTOL in the future.

Should we not recognise the signs, and accept the change to VSTOL without going through the time consuming and painful processes which the navies of the world went through in changing from wood to iron, sail to steam, etc?

Department of Defence
P. A. Newcomb
Canberra, ACT
Commander, RAN

**DISTRIBUTION**

In the May/June issue you wrote of the lead time involved in preparing an issue. In a later paragraph you wrote of the need to ensure the widest possible distribution. This issue reached me on 21 August; it has taken four and a half months from the time that the draft went to the printer. Whether the problem is with the printer, the transporter, the distribution agency or the unit doesn’t really matter, but the result is delay. The Journal has articles of interest and value but it is hard to have a positive and enthusiastic attitude to a magazine that appears spasmodically on my desk when I don’t have time to read it properly or to think about it.

I would welcome the chance to subscribe to the Journal if it meant that I would get my copy sent to me, on time. Automatic distribution doesn’t work; it was one of the problems of the *Army Journal* and it would be a shame to see the same thing happen to the *Defence Force Journal*. I am not advocating the abandonment of distribution to units—this contributes to knowledge amongst all ranks—but if the system cannot run to individually addressed copies to all officers, let us set up a commercial operation to achieve it. If it is reasonably priced I think a lot of people would be interested in taking part.

RMC, Duntroon, ACT

M. G. Langley
Major

**REVIEW ERRATA**

Wing Commander Philip’s review of Sir Richard Williams’ autobiography, *These Are Facts* (DFJ No. 11, July/August 1978) was a fine tribute to an outstanding book, but I am afraid that the reviewer was misled on two points. For the record, I did not supply any of the photographs, nor did I have anything to do with the annexes. All credit for these sections of the book must go to Sir Richard, who selected the illustrations from his own private collection, and also provided the appendixes.

Canberra, ACT

Keith Isaacs
Group Captain, RAAF (Retd)
The company signaller, his brow creased with concentration, squatted beside his crackling radio. Over his right shoulder the flat scrubby landscape stretched on into the hazy distance. It was early morning but already the rays of the sun presaged yet another blistering day for the Territory, south of Tennant Creek. The spluttering radio now held the attention of the company commander of 'Charlie' Company and he knelt beside his signaller, concentrating on the message which informed him that the enemy force had been sighted and was continuing its advance astride the Stuart Highway.

Yesterday, 'Bravo' Company whose area of operations was to the north, had conducted a successful non-designated contact against the forward elements of the enemy's armour. The RAAF fighters had completed their delivery of GBU-CBU standing off some 40 km from the enemy's advancing column. The terminal guided sub-missile attack which was pressed home on the tail of the fighter strike, using battlefield support missiles, took further toll of the enemy's armour. His counter action drill of sweeping the flanks achieved nothing as the battle had developed by remote means with infra-red homing devices contained in the missiles guiding them to their targets. The scout element of one of 'Bravo' Company's forward platoons which had located the enemy and determined a killing zone had long since departed, leaving the road to the enemy.

The enemy's advance guard was now well into 'Charlie' Company's area of operations. Reports indicated that he had slowed his advance and had deployed flank guards on both sides of the road. As his flanking force ground through the bulwaddi and spinifex the first of 6 Brigade's terminal guided sub-missiles reached the probing armour; simultaneous explosions rent the air, signalling the start of a designated attack with seven company vehicle-mounted designators marking targets from dispersed, covert positions on both of the enemy's flanks.

Seventy-two hours later, on the same stretch of road, the company gained its opportunity to come to grips with the enemy at close quarters. Amid the shattered wrecks of enemy armour, a convoy of soft-skinned logistic vehicles carrying vital fuel and ammunition forward to the advancing forces was effectively engaged by medium range anti-armour weapons (MRAAW) and machine guns.

With the setting sun, the shades of evening stretched across the Tanami and once again this interminable land was cloaked in darkness. The enemy commander found time to reflect upon this enterprise — to ruminate over the losses in both armoured and soft-skinned vehicles. With growing apprehension he pondered on the efficacy of using unescorted logistic convoys. Problems crowded his mind: the loss of momentum from a slowed advance, an imposed requirement to detach forces for convoy protection, and above all, where were the defending forces? The darkness of the night matched the gloom that pervaded his innermost thoughts . . .

The first article by these authors appeared in issue No. 10 (May/June 1978) entitled "The Defence of Australia: A Bi-mobile Concept for the Army".
Synopsis

In a previous article published in the May/June edition of the Defence Force Journal, a force structure for the Army was outlined. The evolution of this structure was based on the identification, in general terms, of the level of threat, a philosophy for the conduct of future operations, and a strategy which permits the development of necessary force characteristics suited to the Australian environment.

The article expounded a concept of continental strategy in view of Australia’s limited population and financial resources. This concept identified the need for a balanced force structured to defend Australia, including internal and external lines of communication and to project such strikepower as was available only after meeting these commitments.

In terms of land forces, the Australian environment indicates a requirement for force mobility which is best achieved using a bi-mobile structure centred on airmobile and armoured forces. This structure is dependent on equipment intensive forces having recourse to surveillance devices, precision guided munitions (PGM) and the means of achieving strategic, tactical and battlefield mobility. The cost penalties attracted by such an equipment intensive force, however, are largely offset by the fact that an army raised from a small
population can be given the potential to win. This equipment intensive and manpower restricted force needs to be carefully husbanded to achieve success on the battlefield. With this in mind the bi-mobile force would need to utilize a defence concept which includes attrition and containment of enemy forces before attempting their eviction.

The 'Industrial Fortress' Approach

The defence dilemma lies in the fact that although the Northern and Western regions contain resources of great economic importance, the population and industry so vital to any defence effort lies in the South East. This is the only area from which the manpower and equipment to contain and finally evict the enemy can be drawn. It is the vital area which must be defended. This notion leads to the conclusion that naval, air and ground forces should be so disposed in the South East region as to provide protection to the industrial complex, the population and the internal and external strategic lines of communication. Such a disposition of military force increases the risk to the enemy of mounting operations in the South East region but in turn exposes the Northern and Western regions.

The very nature of this area—its geography, sheer size and paucity of road and rail communications—exacerbates the enemy's problems of conventional force movement and logistics. In addition, this region provides Australian forces with a wider choice of areas of operation.

To incorporate the total requirement, force dispositions and capabilities should include:

- A concentration of naval, air and ground forces in the South East region.
- Surveillance to include 'over the horizon' radar to scan seawards of the remote Northern and Western regions and a facility for coastal patrolling in that area.
- Strategic mobility for ground forces to facilitate movement to the remote regions once a threat is perceived.

Prospectivus

The purpose of this article is to project the notion of bi-mobile force operations, based on the stated concept of defence, into the future and from this projection develop an organization. The development of such an organization depends on the requirement for the force to operate in the northern and south eastern modes.

The Airmobile Division

The concept of operations in the northern mode is based on the purpose of reducing the enemy's combat power by the use of minimum-sized ground forces in conjunction with the air force. To facilitate this, small sub-unit operations using the 'hit and run' approach, will be conducted. Modern technology will confer on these sub-units unprecedented striking power in the form of terminally guided weapons delivered by missiles, aircraft or remotely piloted vehicles (RPV). The fundamental tenet of these operations is that the force does not attempt a confrontation with enemy combat power—it dispersions and permits the enemy to pass through, emerging to strike his flanks and rear.

These operations are principally based on the laser designator and the radio. A strike operation can be mounted in one of three ways:

- **Calling for terminally homing fire (non-designated).** Once a target is located, details are passed to the firing unit and/or RAAF who launch weapons capable of homing on target signature (eg. infra-red emission of a vehicle). As the target is remote from our heavy force the problems for such homing systems of differentiating between friend and foe do not exist.

- **Calling for designated fire.** A target is located and a strike called in. At the appropriate time the observers illuminate the target/s with laser designators which allow the warheads/bombs to home onto the reflected laser beams. A disadvantage of this active system is its susceptibility to detection. The problem of co-ordination during multiple strikes—ensuring that designators and bombs are on different matched frequencies to avoid all bombs 'homing' on a single target—detracts somewhat from this approach. The accuracy of the strike, however, counter-vails these disadvantages. Unprecedented accuracy with warheads makes designated strikes highly cost effective, particularly against targets without a strong signature or near friendly troops.
• **The direct attack.** This is a conventional attack with infantry weapons and would usually take the form of an ambush. Medium range anti-armour missiles and machine guns would provide fire of great accuracy and volume.

The mode of attack used would depend on the circumstances and weapons available. In general terms, terminally guided fire would be used against formed armoured elements; designated fire would be used against administrative echelons or armour in terrain favouring the airmobile force; while direct attack could be used against supply vehicles.

Desert mobility will require a large number of small, cheap, multiple wheel drive vehicles capable of carrying men, weapons, radios and equipment; a possible example is shown in Figure 3. A proportion of the vehicles must carry MRAAWS or GPMG for self defence and the direct attack role. A laser designator with a range of at least 4,000 m will be necessary to allow target illumination from a reasonably safe range. Target information must be transmitted in a manner that will minimise the risk of effective jamming or direction finding. The transmission of short bursts of data using a fixed format message entry device such as that used in the US Tacfire system would seem to be appropriate.

As well as being able to conduct operations in the remote northern and western regions, the airmobile division must be capable of fighting in the south-east of Australia. In this vital industrial area with its relatively high population density, the division must be capable of operations in the conventional airportable role. The organization table of this division is shown at Figure 1, depicting the formation divided into those elements required for the Northern mode with components needed for operations in the South Eastern mode being shown as an increment.

Figure 2 shows in diagramatic form a typical deployment of an airmobile brigade for operations in the northern mode. It is not intended, in an article of this length to deal in detail with the employment of the airmobile division,
However, to establish a notion for the conduct of operations, elements of the force and its administration are identified.

**The dispersed brigades.** Given the worst case contingency of an enemy invasion force using a number of landings over a wide area, brigades of the airmobile division will be allocated areas of responsibility astride the enemy's axes of advance. Areas of operation (AO) will, in turn, be given to battalions. The battalion organization in outline is shown at Figure 4. In this mode the companies are the basic fighting elements of the division and would be deployed laterally across the enemy's axis of advance. Each company's AO would extend some 150 km along the axis and 250 km on either side of it, affording about 75,000 sq km in which to conceal thirty-one vehicles from the enemy. As it is likely that the enemy's air force will generally dominate the battlefield area, the ground force must have an air defence capability as well as possessing radar and IR reflective camouflage nets.

**Battlefield Support.** The Battlefield Support Missile battery (or batteries if greater strength is available) will deploy forward so that it can support the foremost companies and fall back as the enemy advances, keeping, say, 200 km in front of the foremost enemy troops. Unless the battlefield support missile has a range in the order of 1,000 km this will result in the forward troops being left with only air support but the missile battery will continue to harry the enemy's forward elements which, presumably will be the best defended from air or ground attack.

**The brigade maintenance area.** This maintenance area will be located well to the rear of the deployed brigade and will be established near an airhead. The units in this area must be capable of rapid redeployment. Within this area will be:

- Brigade HQ, as its function will be one of co-ordination rather than command.
- An air defence battery (less one troop with the battlefield support battery) to defend the airhead.
- An augmented field engineer regiment for airfield extension/repair/construction.
- An air despatch troop to prepare supplies to be flown to the forward units.
• A supply company.
• A field workshop capable of repairing the equipment of units as they rotate out of the battlefield area.
• A field ambulance (less elements deployed forward) to receive casualties for air movement either to a mobile hospital or a base hospital in the support area.

**Insertion of the force.** Insertion will be carried out by air using medium or short range STOL transport. As enemy axes are identified, units will be deployed in front of, but out of contact with, the advancing troops. RAAF 'top cover' will be required to neutralize enemy fighters; the RAAF has already identified the need for the TFF (tactical fighter force) to be oriented to air defence.

**Maintenance.** As well as troops and vehicles, combat supplies will be air landed or dropped and ferried to caches by the light vehicles before the force disperses. Resupply of emergency rations, POL and ammunition will be undertaken on a periodic basis from the brigade maintenance area. The size of Australia will improve the survivability of single, random sorties flown probably at night; however, if the enemy has an AWACS capability, special measures may be necessary. Unit repairs to equipment would be conducted 'in situ'. Equipment beyond unit repair in the battle area would have to be abandoned. Intensive servicing and repair would be carried out when units rotate out of the battle area to the maintenance area.

**Extraction of the force.** Extraction, will normally occur by utilizing the deployed force's own means of transport, with small dispersed groups simply driving out of the area. The size of Australia indicates that it is likely the protagonists will have at least one open flank. In extreme emergencies, if normal extraction becomes impossible, vehicles may be abandoned and the force extracted by air. In these circumstances, air superiority will have to be achieved for a short period.

**South Eastern Mode.** In the South East, the division would function as a conventional air-mobile formation. Although it is relatively light in terms of operations against an armoured force, the ranges along the East coast, as well as being mountainous are generally heavily timbered and favour infantry operations. Air-mobile forces would also be of value in a conventional role in very broken mountain areas (such as parts of the Kimberleys, for example) and in coup de main operations in support of the armoured force. Utility helicopters have demonstrated a considerable capability to make deep incursions during mobile operations if properly co-ordinated with other forces. An outline of an infantry battalion in the conventional mode is shown at Figure 5.

The degree of flexibility of employment may be enhanced by supplementing the division's light vehicles with RACT medium GS transport for specific operations to provide the force with a conventional motorized capability.

**The Armoured Division**

The concept for the defence of Australia requires forces to attrite the enemy and to contain him prior to mounting offensive operations which will finally cause his eviction. The capacity to absorb the enemy's combat power and with its own inherent firepower and mobility gain offensive momentum, rests with armoured forces.

The armoured division is a formation not raised in the Australian Army since 1945 when the last of the rather skeletal wartime
armoured formations was disbanded. Since that time the emphasis on jungle warfare has debilitated the understanding of ground mobile operations in the Australian Army. Indeed, there appears to be a general lack of insight on the structure and use of such forces.

Developments

An armoured division does not consist wholly of tanks; its main striking power is conferred by a core of tanks, operating in co-operation with other arms which are mechanized to allow them to keep up with the tanks. German experience in World War II indicated that an equal balance of tanks and mechanized infantry produced the best results. Most western armies have since generally followed this lead. The Germans also favoured the use of mechanized infantry (Panzergrenadier) divisions to follow and mop up after the panzer divisions. A corps of two panzer and one panzergrenadier divisions was found to have the flexibility to undertake most tasks. A mechanized division is similar to an armoured division but with a preponderence of infantry over tank units in a ratio of 2:1 or 3:1 rather than the 1:1 ratio of the armoured division. Today the distinction between these formations is becoming blurred and the US Army now proposes to replace both armoured and mechanized divisions with ‘heavy divisions’ on a common establishment. This approach differs from the current German concept which generally utilizes ‘tailored’ formations in defence of known areas. It would seem that the ‘heavy division’ approach is eminently suitable for the Australian situation as it permits flexible, economic employment of the force where the threat and likely area of operations is not defined.

The ‘Equipment Intensive’ Concept

The fighting capability of all army formations has increased dramatically in the last century. Research in the United States indicates that the average division of the American Civil War had a strength of about 8,000, most of them fighting soldiers, and was responsible for a frontage of about one kilometre. A modern US mechanized division has about twice as many men and is responsible for a frontage of about 40 km—a density of about 413 men per kilometre of whom about 75 are combat infantrymen or AFV crewmen. However, these 75 soldiers have at their disposal 80 times the weight of fire of a Civil War division and six times the firepower of a World War II division. The current Australian infantry division is expected to hold a front of about 30 km—a formidable task, made more daunting by the limited firepower and mobility of the force. A parsimonious approach to defence expenditure coupled with limitations on the availability of manpower due to a small population base, point to the need for ‘equipment intensive’ forces. An armoured division, even though constrained in manpower could provide the necessary firepower and battlefield mobility to meet the requirements to contain an enemy using high technology weapons and equipment.

Firepower and Mobility

The armoured division represents the heaviest concentration of conventional firepower in any equivalent sized formation. Long range direct anti-armour and high explosive fire is provided by tank guns and anti-armour missiles. Advances in rangefinders, integrated fire control systems and gun/ammunition design are bringing the effective range of the tank gun out to about 3,000m while corresponding advances in guided weapons indicate a range capability of 10,000m or more. Indirect fire support is provided by self propelled artillery and strike aircraft. In view of the capabilities of modern air defence systems it seems likely that the RAAF support of the field army will be limited to ‘stand-off’ strike to attrite the enemy. This will conserve our small stocks of aircraft for air defence and interdiction. As the enemy will also presumably have stand off PGM which can be launched from outside the range of divisional air defence weapons, the RAAF will be more effectively employed in air defence than in supplementing the artillery in the fire support role.

The armoured formation has a high degree of tactical and battlefield mobility conferred on it by its armoured and tracked vehicles. This mobility can only be guaranteed as long as sufficient transport to carry supplies and spare parts to the units is available. Due to the lack of roads in much of Australia and the likelihood of those being interdicted some, at least, of the transport must have a real cross country mobility. Equipment must be mechani-
THE BI-MOBILE FORCE

reliably reliable and designed for fast maintenance and repair so that it is capable of protracted moves. As the problem of armoured forces is to achieve strategic mobility attention must be paid to the heavy road transport and rail flat cars need to move vehicles. On mobilization it may be possible to requisition transporters used by local government authorities to move engineer plant but this use must be balanced against the likely need to move plant to locations in the support area for road maintenance and bomb damage clearance tasks in the cities.

Organization

The Australian requirement for a flexible force capable of fighting in widely varied terrain indicates a need for a balance of tank and infantry units capable of fighting in task oriented battle groups—that is a mixture of tank squadrons and mechanized infantry companies commanded by either tank or mechanized regimental headquarters. The organization at Figure 6 shows six of each unit, allowing the formation of three balanced 'square' brigades or other combinations to meet varying circumstances. The units are smaller than their present Australian equivalents. This is in line with current US studies\(^\text{11}\) which have indicated that:

- smaller subunits, eg. three tank troops and three APC mechanized platoons, are easier to control, particularly in an ECM environment;
- a larger number of smaller units gives the formation commander more flexibility;
- the basic tactical subunit in war is the squadron/company and the size of the troop/platoon is of lesser importance than it appears in peacetime when the requirement to train junior officers in basic procedures tends to put an emphasis on troop/platoon tactics; and
- in war, when turnover of troop/platoon commanders is high, a small subunit simplifies the job of an inexperienced junior officer.

The fire support of the division will come almost entirely from artillery and close air support must be regarded as an occasional luxury. The divisional artillery must be fought as an entity as it permits the commander to rapidly apply massive firepower to any part of the divisional area. As the shibboleth of

\[\text{Figure 6}\]
guaranteed direct support artillery will no longer apply, both armoured and infantry units will need organic mortars to provide such support. The main weight of the armoured divisional artillery will come from self propelled (SP) medium guns augmented by heavy guns. Medium guns can also fire the Cannon Launched Guided Projectile to provide pinpoint accuracy. A heavy weight of fire in a short time can be provided by multi-barrelled rocket launchers (MBRL) which though not particularly accurate have a significant neutralizing effect.

Long range anti-armour fire will be provided by guided missiles. The division will have a capability to deploy missiles on the ground from the vehicles of the anti-armour squadron or from the air using the aircraft of the armed helicopter squadron.

Cost Effectiveness

The armoured division represents a major outlay on equipment. Economies must be exercised in procurement including the scaling of spare parts and the requirement for repair pools. This indicates a need for maximum use of common chassis in armoured vehicles. The Australian Army currently has two families of AFVs, one tank and one light. War experience has indicated a need for an infantry carrier that can stay with the tanks under all conditions thus requiring equivalent armour protection as well as comparable cross country mobility. The obvious solution would be to use one chassis for both and the Argentinians have already achieved this with the TAM/VCI which is based on the German Marder chassis (see Figure 7). A common chassis would provide the traditional tank family (ARV, MTD and AVL) as well as the infantry vehicles (carrier, mortar vehicle and anti-armour missile vehicle). Further economies could be achieved if the same suspension and power pack was used for a partially armoured tracked load carrier which could carry modules (armoured if required) to fulfill the various support roles such as fitters vehicles and command post vehicle. The reconnaissance vehicle family would be another totally separate design but should be able to share suspension and power pack components. Different power requirements could be met by a system similar to the current German family of diesel engines where basically the same design with differing numbers of cylinders is used in all AFVs.

Conclusion

"It is folly to raise a single company, squadron or battery before it is known exactly what place it is to take in some definite organization, authorized for some definite purpose."

Sir Ian Hamilton — 1921

The problem of identifying a definite threat to Australia in the future has preoccupied the thoughts of many experts all of whom have been unable to resolve the issue. In recent years, the notion that force structuring should be based on a loose requirement to provide a force capable of deploying an element for short term contingencies and to defend mainland Australia, has gained favour; this notion is a dangerous one. Its danger lies in the fact that structuring of forces on this basis has no valid objective, and therefore could lead to an irrational and inappropriate force development.

Planning against the worst possible case, that of a major invasion of Australia by an enemy with access to a high level of technology, leads to the conclusion that a mobile, powerful armoured force would be necessary. Concomitant with this requirement is the need to provide a force with the potential to attrite the enemy in the early stages of mid and high intensity operations while being able to conduct multifarious actions at low intensity level (eg. counter terrorist operations). This points to a relatively light but highly mobile force. The approach of planning against the worst possible case permits the development of a force capable of meeting low intensity operational require-
ments as well as being able to cope with situations of high threat to Australia. Such is not the case where the force has been structured principally to contend with low threat situations.

With these criteria in mind, the force-in-being should be established on the bimobile concept, principally consisting of air-mobile and armoured forces. In the article published in the May/June edition of the Defence Force Journal, the re-organization of the current ARA and ARES units into the bi-mobile force was outlined. This re-organization provides, in embryo, the base requirements from which future development towards an objective force may be achieved. The direction this development should take in terms of proportion — airmobile to armoured — will become obvious as the threat is perceived in more finite terms.

Above all, the bi-mobile force is an equipment intensive and manpower restricted one. Although significant economies may be achieved through savings in wages and support, the necessary equipments incur penalties of cost. There are those detractors who would pose the question: how much will it cost to get this capability? In fact, the more relevant question should be: how much will it cost not to have this capability?

NOTES

1. A non designated strike is made using weapons with self-contained seekers that home onto the target.
2. Glide Bomb Unit—Cluster Bomb Unit, i.e. a CBU fitted with a GBU kit to enable it to be used as a standoff weapon.
3. A designated strike is made using devices to illuminate the target for seekers in the weapon.
7. Airborne Early Warning and Control System.
8. For example on the US Army Air Cavalry Combat Brigade trial and exercises associated with the Triple Capability (TRICAP) Division such as ‘Gallant Hand’.
12. While CLGP is capable of hitting a point target illuminated by a laser designator it represents major control problems for anything but single gun engagements. The frequency of shells and designators must be co-ordinated and each projectile must be called for by the appropriate designator. In the face of a massed attack by armour a conventional HE concentration would seem to be more effective. The Israelis in 1973 again proved the effectiveness of ten rounds fire for effect from three battalions of 155mm guns — and their artillery battalions were small, only 12 guns. CLGP would seem most useful for destruction missions on vital targets or specialist vehicles.
13. The Soviets have led the world in MBRL. A battalion (18 launchers) of their BM-21 can deliver a 47.962 tonne salvo onto a target in 30 seconds. Recent western developments have tended to launchers which fire a smaller number of more accurate rockets. As it seems unlikely that unguided rockets will ever be more accurate than guns it would seem more sensible to follow the Soviet lead of ‘cheap and nasty’ rockets. This allows the very heavy burst of fire in a very short time that cannot be matched by an equivalent sized gun unit.
15. Medium Tank Dozer.
16. Armoured Vehicle Launcher Bridge (for those who prefer to speak English, A Tank Bridge-layer).

Award: Issue No. 12 (September/October 1978)

The Board of Management has awarded the prize of $30 for the best original article in the September/October 1978 issue (No. 12) of the Defence Force Journal to Commander P. J. M. Shevlin, AM, RAN for his article An Operational Concept for the Australian Amphibious Force.
Mr H. A. d'Assumpcao  
Superintending Scientist  
Systems Analysis Division  
Defence Research Centre

It has been said that there are only three really challenging frontiers left — outer space, Antarctica, and the depths of the oceans. Although man has sailed the seas since prehistoric times, the ocean depths present such a hostile environment that it is only very recently that he has been able to explore more than the upper thirty metres or so of water.

The introduction in this century of the submarine as a viable weapon of war, stimulated investigations into means of countering it, and this added a strong impetus to the study of certain aspects of marine science.

The detection of submarines is rendered difficult by the fact that most forms of energy do not propagate far underwater. Figure 1 shows the absorption of electromagnetic waves in sea-water. It can be seen that the attenuation is extraordinarily high. For example, at the microwave frequencies used in radar, energy would only effectively penetrate a fraction of a metre into sea-water. As frequency increases (i.e., as wavelength decreases) the absorption increases yet further, reaching a peak in the infra-red region of some \(3 \times 10^6\) dB/m. This means that, for every millionth of a metre of travel in sea-water, half the power is absorbed! Even in the blue/green portion of the visible spectrum, where the attenuation is at a minimum, effective penetration is only through a few hundred metres of sea-water.

Fortunately, there is one form of energy — sound — which can propagate well underwater. The absorption of sound is plotted in figure 2. At comparable wavelengths it can be seen that absorption of sound is many orders of magnitude less than that of electromagnetic waves. It is no accident that many fish have evolved with a highly-developed sense of hearing.

The possibility of using underwater sound for detection was realised at least as far back as 1490, when Leonardo da Vinci wrote: "If you cause your ship to stop, and place the head of a long tube in the water and place the outer extremity in your ear, you will hear ships at a great distance from you." Devices using sound for detection underwater were developed in Britain and France during World War I, and gradually evolved into the wide range of sophisticated sonars used today.

In the early days, sonar (asdic) detection of submarines was found to be unpredictable.
Good detection ranges would be obtained on occasion, whilst at other times the submarine would not be detected even at very short ranges. Just before World War II it became clear that this was not due to equipment troubles but to subtle changes in the properties of the ocean. To understand the behaviour of sound underwater, it is necessary to examine the physical properties of the sea.

A sound made underwater travels at a speed of about 1520 m/s (some 4\(\frac{1}{2}\) times faster than in air). However, this speed is not constant, but increases slightly with water temperature, pressure and salinity—temperature variations having the greatest effect.

Water temperature at any one site is itself not constant but changes with depth in a complicated way. Near the surface, there is frequently found a region called the 'mixed layer' in which the temperature is sensibly constant due to mixing, as illustrated in figure 3(a). The thickness of the mixed layer is very variable and ranges from a few tens of metres in summer to a few hundred metres in winter. Beneath this layer the temperature falls—first sharply and then more gradually—until at great depths it is close to O°C.
Pressure, of course, increases uniformly with depth so that, all else being constant, the velocity of sound would increase with depth. Salinity change has a small effect, and can usually (but not always) be ignored.

The net effect when one combines these factors is that the velocity profile takes a complicated shape, as shown in figure 3(b). Near the surface, in the mixed layer, temperature is constant, so that velocity increases with depth (because pressure increases). Below the mixed layer, the temperature falls sharply, causing the velocity to fall as well. Then at great depths the temperature is almost constant, so that pressure effects again take over, and the velocity increases with depth.

Because of these changes in velocity, sound propagates in a curious fashion. Perhaps the best way to illustrate the effect is to consider a platoon of soldiers marching line abreast, a situation analogous to the propagation of a plane wavefront of sound. Imagine that the ground on which they are marching is not uniform, but ranges from bitumen at one end of the line to thick mud at the other. The soldiers on firm ground would be able to progress faster, while those bogged down in the mud would move more slowly; after a while, the line would be tilted as illustrated in figure 4.

The analogous effect occurs with a wavefront of sound. If the velocity of propagation increases with depth, a plane wavefront that is initially vertical would, after a while, be tilted; since the direction of propagation is at right angles to the wavefront, the ray of sound would be bent upwards. The converse effect applies when the velocity of sound decreases with depth—the rays are bent downwards.

Consider now a ray which starts off near the surface, travelling nearly horizontally (ray A in figure 5). Since the velocity is increasing with depth, that ray will be bent upwards travelling in an arc until it strikes the sea surface, where it will be reflected and the process repeated. That ray will be trapped near the surface, skipping along in what is called the 'surface duct' or 'surface sound channel'.

Next consider ray B in figure 5, which starts off at a somewhat steeper angle. It too is bent upwards, but is still inclined at an angle by the
time it arrives at the bottom of the mixed layer, From this point, velocity decreases with depth, so the ray is bent downwards. At still greater depths, the velocity gradient is reversed, so that the ray is bent upwards again, to reappear near the surface, typically some thirty nautical miles from its origin. Just beneath the surface sound channel there is the so-called ‘shadow zone’ where there are no sound arrivals by direct path. In this region, a submarine may safely lurk undetected. (Of course, there is a path via bottom reflection, as illustrated by ray C, but sound travelling by this path will have had to travel a long way to the bottom and back, and also suffer attenuation when reflected from the bottom.)

The foregoing paragraphs serve to illustrate the complicated nature of sound propagation underwater. In fact, the situation in practice is even worse. Not only do the properties of water vary with depth, but also with geographical location, season of year and even time of day; they are also affected by ocean currents and the previous history of meteorological conditions. The understanding of the effects of all these interacting factors is the subject of continuing research in physical oceanology.

Sound propagation is, of course, only part of the overall picture. To detect a submarine one has to consider the sonar system as a whole.

Sonars fall broadly into two classes: ‘active’ sonar, in which one transmits a sound and listens for the echo from the submarine, and ‘passive’ sonar, in which one just listens for the noise the submarine itself emits. In each case, one has to detect a signal in the midst of a cacophony of other sounds heard underwater, collectively termed ‘ambient noise’. Ambient noise is produced by a wide variety of sources: surface waves breaking, ships, marine life, rain and even seismic disturbances. On top of all this, there is self-noise from the sonar itself, which includes the noise contributed by the platform on which the sonar is mounted. For example, a sonar mounted under a ship has to contend with the noise that that vessel itself makes.

In the case of active sonar, there is yet another source of interference. Apart from the echo from the submarine, there will as well be received echoes (termed ‘reverberation’) from the sea boundaries (surface and bottom) and from fish. It is apparent that a large fish such as a whale can be mistaken for a submarine, but even small fish can give trouble. Certain of these possess air bags (‘swim bladders’) which they use to maintain neutral buoyancy. If the volume of the swim bladder is right, it can resonate when excited by the sonar transmission and return an echo out of all proportion to its size; echoes from a school of such fish can completely mask out a submarine’s echo.

The understanding of these and other aspects of oceanology and underwater acoustics has provided the key to improvements to sonar; but developments in recent years have taken
place over a broad front of activities. Sonar transducers to convert electrical energy to sound and vice-versa have been made more powerful, more efficient and more highly directional. More sophisticated signal processing has been used to extract ever weaker signals out of a background of noise and reverberation, and to localise a submarine accurately when detected. Improved displays and classification techniques have been employed to allow discrimination between genuine submarine signals and those from other targets. Last but by no means least, engineering technology has improved to make equipment more robust, compact and reliable, lighter and easier to maintain.

Although most of the advances have been made overseas, Australian scientists and engineers working in these fields have made very significant contributions and have in the process gained international recognition. For example, studies at the Weapons Research Establishment (now the Defence Research Centre) have led to the ability to predict the depth of the mixed layer from a knowledge of sea surface currents which, in turn, can be deduced from airborne or satellite measurements; such knowledge about the mixed layer is important when assessing the performance of ship-mounted sonars. Work on signal processing led to the concept on which the BARRA sonobuoy system is based. Investigations carried out at the RAN Research Laboratory on the vagaries of sound propagation laid the foundation for the MULLOKA ship-mounted sonar system.

While this work is oriented primarily towards defence, there are spin-off benefits to non-military applications, and an understanding of the ocean currents is relevant to fishing, shipping and meteorology.

For example, studies of the East Australian Current conducted jointly by the RAN Research Laboratory and WRE have shown that current rings or eddies can persist south-east of Sydney for up to three months. Figure 6 shows one such ring 125 km in diameter with anticlockwise currents up to 4 knots; a ship passing through such a ring would be moved a significant distance off course. The water inside the rings is up to 4°C higher in temperature than surrounding water and the presence of such a large mass of warm water affects the climate of the eastern seaboard. In the relatively turbulent water at the outer edge of the ring strong temperature changes, or fronts, are found which affect the distribution of tunafish. (Tuna tend to collect in schools where the water temperature is 18 to 20°C.)

Another example concerns the life cycle of the West Australian rock lobster. The very young lobsters disappear out to sea from the west coast to a latitude around 30°S; six months later some of them reappear near their point of origin, in adult form. Once at sea, it is expected that they would be swept south by the West Australian current. Since their swimming capability is quite limited, it has been something of a puzzle to scientists how they can make their way back. An explanation has been put for-
ward by Andrews, who has been making a study of currents in that area. The West Australian current comprises a very large clockwise stream, and a series of anticyclonic (H) and cyclonic (L) current rings, as illustrated in figure 7. It is conjectured that the young lobsters are carried south down the coast and transferred into and out of eddies in a general clockwise direction in a journey of thousands of kilometres, to reappear at their point of departure six months later. Of course, only a small percentage would return to maintain the population; the others would be carried off to unknown destinations by the vagaries of the eddying currents.

Although some progress in marine science has been made in Australia, there is still a great deal about the oceans that is poorly understood and the vast expanse of water around Australia remains largely unexplored. Whilst developments have given anti-submarine forces an improved capability, submarines are improving as well; they are becoming faster and quieter, have longer endurance and are being armed with a formidable arsenal of weapons.

REFERENCES

LETTER TO THE EDITOR
A common theme in many of your articles has been that the press always gets it wrong, that comments by the daily press are uninformed and inaccurate.

Specifically (and if my memory serves me right) a prize-winning article in the Defence Force Journal last year was based on dismissing out of hand a report of mine in The Australian a couple of years ago during Kangaroo II which said that the Enterprise's F-14s and strike fighters eliminated RAAF air defences. Your correspondent echoed conventional RAAF wisdom of the time by ignoring longrange AAM use and confining his dismissal of my report purely to the performance of the Mirage force in the close-in air-combat situation.

Of course the reason for a lot of this misunderstanding on the part of serving officers is that the complexities of such factors as the TFF choice or the RAN's Melbourne replacement simply aren't understood outside the closed defence community and no proper attempt is made at civilian, military or ministerial levels to communicate these complexities.

In fact, one could say that the factors aren't understood entirely within the defence sector either, as shown by D. Churchus's letter (DFJ No. 11) advocating a two-type TFF solution and the very elementary restatement of facts in reply by Dr R. J. O'Neill. Incidentally, Churchus once again makes the common mistake of translating the American obsession a few years ago with 'hi-lo' force mix as meaning high and low altitude, whereas it refers to costs and capabilities (and hence numbers).

Having got that off my chest, I would now invite you to look somewhat closer to home. Your issue No. 11 could sadly do with professional journalistic help.

To take a couple of instances, in Dr L. H. Barber's "The Waipa Campaign in New Zealand Land Wars" an excellent article was marred by some bad errors in the maps. The first map, for instance, shows "Waikaio R." instead of Waikato, and spells the pa part of Gate Pa as pah (an old-fashioned spelling not used in Dr Barber's text). On the second map, the Punui River is misspelt Puniu.

By and large, I find your chapter head drawings strike an amateurish and discordant note. The British soldier confronting what is apparently meant to be a Maori warrior (sic) with a bayonet is not only in bad taste and an echo of the colonialist attitude Dr Barber attributed to the British invaders. But technically it would seem to arm the Maori with a weapon that traditionally was not in his inventory. It certainly jibes with Dr Barber's text of "Taiaha-wielding 'rebels' ".

And then on p. 49, in the introduction of Major A. E. W. Stormer's Airships article, surely the Hindenburgh (sic) exploded in 1937, not 1927 as is printed?

Peregrine Features  John Stackhouse
Sydney, NSW
The RODC Enquiry

An item in the Defence Force Journal No. 4 (May/June 1977) described in outline the purpose of an enquiry being conducted by the Army into officer development. The enquiry, conducted by the Regular Officer Development Committee (RODC), is now completed and the results have been presented to the Chief of the General Staff (CGS) in six volumes: *Report; *Study One: The Asset; *Study Two: Education and Training; *Study Three: Career Management; *Study Four: The Future; and *Study Five: Women Officers and "Specialized Corps".

The enquiry has been the broadest in scope of any personnel study conducted by the Defence Force. The RODC included a full-time project staff of six officers and a support staff of four. Academics and businessmen contributed to the enquiry. The RAN, RAAF and Department of Defence (Central Office) provided both formal and informal assistance. A large majority of the 4,300 serving regular Army officers were involved through survey questionnaires, group discussions, individual interviews and the provision of written submissions. Widespread interest in the outcome of the enquiry is apparent, and all regular Army officers have been advised by a personal letter from the CGS of how the Report recommendations are to be considered and, where appropriate, implemented.

The Report and Studies have been printed and distributed widely, particularly within the Army. A number of copies have been sent to the Department of Defence (Central, Navy and Air Office), the RAAF Staff College and the Defence Library Service.

Content of the Report and Studies

The following synopsis may be a useful reference. The Report volume is essentially a summary of the Studies. It identifies the key issues addressed by the RODC and assesses what the future may hold. It includes one chapter for each Study, describes a concept for officer development and draws together the recommendations and implementation proposals.

Study One 'The Asset' deals with structural issues such as the officer asset and liability, manpower planning and officer inflows and outflows. It also proposes new policies for promotion and career divisions.

Study Two 'Education and Training' examines the extent and the nature of the need for education within the profession of arms. A new pattern of officer training is proposed, as is the need to integrate officer education and training.

Study Three 'Career Management' concentrates on five aspects of the topic in detail, namely: * officer assessment; * appointment management; * the management of promotion; * career planning; and * the career management organization.

Many measures are proposed for the improvement of Army careers through better planning, employment patterns and management methods.

Study Four 'The Future' is in two parts. Part A presents the results of a study which forecasts the nature of the future environment in which officers will operate and uses this forecast to derive implications for officer development. Part B analyses the changing pattern of warfare and the profession of arms and looks in particular at the future development of commanders and of staff officers.

Study Five is also a composite volume. Part A 'Women Officers' examines present policies, legal implications and fundamental issues associated with the employment of women in the Army. Significant change is recommended. Part B 'Specialized Corps' is a study of a number of the smaller and more specialized Corps groups, namely Survey, Chaplains, Medical, Dental, Education, Legal, Psychology, Band and Nursing.

The Management of Implementation

At the time that this article is being written (late September) the RODC Report has already been the subject of extensive consideration by the CGS and his Advisory Committee. The concept for officer development described in the RODC Report has been generally endorsed and has been issued by the CGS with the letter to all officers referred to earlier.

Co-ordination of the consideration and implementation of RODC recommendations is the responsibility of the Chief of Personnel—Army. This co-ordination activity—the 'Officer Development Programme' (ODP) — is centred in the office of the Director of Personnel Plans (DPP). Enquiries related to the RODC should be directed to Colonel P. R. Phillips, DPP or to Lieutenant Colonel A. R. Black, SO1 (Personnel Management), DPP, who is the project co-ordinator for ODP.

* It is hoped that reviews of the Report and the various studies will appear shortly in the DFJ — Ed.
With the death of Professor Frank Stanley Cotton on 23 August 1955, Australia lost a man who was probably its internationally best known figure in Aviation Medicine. Professor Cotton was a brilliant, energetic scientist whose enquiring mind reached into many areas of human physiology particularly in the field of physical fitness in competitive swimming and athletics. However he will probably be best remembered for his invention of the Cotton aerodynamic Anti-G suit for the protection of fighter pilots against blackout. The suit and the researches behind its development was the culmination of intensive research work by Professor Cotton and his team at Sydney University in the early 1940s. Their contribution came at a vital time for the allied war effort and is widely acknowledged as having been of the greatest value and significance.

Frank Cotton was born in Sydney on 30 April 1890. He was educated at Sydney High School and the University of Sydney, graduating BSc in 1912. Henceforth his career centred on the Department of Physiology in that Institution. He was appointed lecturer in Physiology in 1913 and awarded the DSc in 1930. There was a brief interlude in 1932-3 when he spent eighteen months on research work in the United States on a Rockefeller Travelling Fellowship. From 1939-1945 he was a Senior Research Fellow of the National Health and Medical Research Council. In 1941 he was appointed Research Professor of Physiology at the University and from 1946 to 1955 he was Professor of Physiology (and head of the Department).

He was Professor Emeritus of Physiology at the time of his death. A fine athlete himself he was an outstanding swimmer during his undergraduate days and for more than twenty years he held the University swimming records for all distances from 200 yds to a mile. At one time he held the NSW State 440 yds and 880 yds swimming titles. In these early years he became interested in the training of athletes often using himself as a guinea pig. At the age of thirty-one he gained preliminary selection for the Olympic Games but did not make the final team. His physiological studies on many famous Australian athletes made a great contribution to the knowledge of correct training and is well recorded elsewhere. His work with scientific colleague and all-round athlete Forbes Carlile is particularly noteworthy. He attended the 1952 Helsinki Olympic Games as Scientific Adviser to the Australian team.

Over the years he published many papers, chiefly in the Australian Journal of Experimental Biology and Medical Science, dealing with the effect of athletic exercise on the heart and circulation, as well as articles on respiration, body centre of gravity changes, and medical education. His 1931 doctoral thesis consisted of a group of papers on body centre of gravity changes, being an investigation of the quantity of blood mobilized by muscles during exercise.

He was ideally situated and prepared for the 'blackout' research when the opportunity came in the early years of World War II.

'Greyout' and 'blackout' were terms originally coined by pilots to describe the condition of sudden loss of vision, often followed by unconsciousness, occurring in pilots during high speed turns in aircraft. A pilot making a sixty
degree bank in an aircraft may experience about two G (twice the force of gravity) and feel very little discomfort. At three G, and above, real discomfort arises, his arm movements are impeded and his legs feel heavy as lead. The centrifugal force is decreasing the blood flow to the head with predictable effects on the brain and retina. Both are very sensitive to lack of oxygen and the retina in particular soon shows its deprivation with 'grey out' or dimness of vision followed by 'blackout'. This latter effect usually occurs when the pilot is experiencing 3-4 G. Thus vision may fail completely with the patient fully conscious. As 5 G approaches the pilot often does lose consciousness. Return of consciousness is then followed by return of vision as the pilot comes out of his turn or dive and the G forces are reduced. Without the advantage of anti-G suit assistance the German Air Force provided their Stuka divebomber pilots with automatic dive 'pull-out' systems which acted while they were temporarily blind or unconscious and unable to perform the manoeuvres manually. In less stressful fighter manoeuvres posturing and straining procedures had to suffice.

'Greyout' and 'blackout' became major problems with the development of the really high speed aircraft in the 1930s. They had been a rare occurrence during the 1914-18 war and then mostly in susceptible individuals pulling out of dives and in aerobatics. In the international Schneider Cup races during the thirties it became commonplace for the competitors to blackout completely in the major turns around the course pylons. The pilots temporarily had little or no control over their aircraft. They soon found that straining, shouting, bending and tensing their muscles or crouching in the seat harness raised their blackout threshold in this critical period. It was assumed that these manoeuvres decreased the relative anaemia of the brain caused by centrifugal force pooling blood in the lower limbs and abdominal vessels. It was a natural step to use abdominal belts and strapping but these probably did little to raise G tolerance and certainly added greatly to pilot discomfort—especially if of the tight air-filled variety. That attempted expiration against a closed glottis (The Valsalva procedure) was also successful in raising G tolerance became an early inexplicable paradox to the physiologists and is not well understood even at the present day.

Some hilarity was introduced when the Schneider Cup pilots were advised to train by taking "adequate, but not excessive, exercise of normal pleasurable forms, with special attention to the tone, or constant elastic tension, of the belly walls".

In the 1930s also came the military development of the dive bombing techniques by the major powers. As previously mentioned, the near vertical dives and pull-outs regularly induced 'greyout' and 'blackout' and even unconsciousness in the pilots of these strong specialized aircraft. In fact the pilots could experience up to nine G which speaks highly of the structural strength of the aircraft and the calibre of the pilots.

In 1934 the Germans (with encouragement from Hermann Goering) constructed the first large human centrifuge at Tempelhof airfield for research into blackout prevention. Their centrifuge which was capable of developing twenty G was followed by similar instruments in Italy and Japan. The Germans failed to develop anti-G suits as a result of their research. It was only in January 1945 when such suits were found on the bodies of crushed P51 Mustang pilots that they intensified their research in this area. One of Germany's leading experts in Aviation Medicine at that time was Dr Hubertus Strughold subsequently to become a leader in America's space programme after the war. His report of the German examination of the American wartime G suits includes the following statement:

"Objective tests by Ruff included measurements in flight and on the centrifuge. The tests revealed a certain improvement of acceleration tolerance but no more than that produced by crouching or by general tension (1.5 G). In view of the strength of German aircraft, of the adequacy of crouching, and of the difficulties involved in the development and production of a similar suit in Germany at that time, the necessity for introducing an anti-G suit could not be seen."

They obviously had knowledge of the Franks water suit for Strughold's report continued: "Trousers with built-in water bladders to neutralize the acceleration forces produced the
greatest possible tolerance but they were impractical for fighter missions."

The Canadians had constructed the first human centrifuge for the allied countries in 1941 and this was sited at the Banting Institute in Toronto. It was there that WGCDR W. R. Franks, RCAF and his team had developed the historic Franks Hydrostatic Flying Suit, which was found to regularly raise the tolerance to acceleration by 2 G or over. The suit consisted of a pair of trousers made of inelastic fabric containing bladders which were filled with water before flight. The garment then provided balanced external pressure during exposure to positive G. It worked but it was bulky, heavy and in its various forms provided some distressing experiences for the pilots. They often became disoriented and had a “feeling of floating on water” “and falling away”. There was also a distressing, inexplicable, and often urgent, diuresis induced on removing the suit after a flight. It is small wonder that the pilots often preferred to continue to use their crouching postures and straining procedures. These could raise their acceleration tolerance by about 2 G—albeit with some fatiguing effort—for the brief seconds of hard G stress.

In spite of all this the Franks water suit was the prototype for the development of all future G suits and was certainly the first suit produced to afford protection against blackout.

It was with this background that Professor Cotton entered the scene with his research commencing late in 1940. The initial work centred on human cardiac output in various circumstances. Foremost in his mind was the goal of finding an efficient practical means of maintaining a pilot’s head circulation when exposed to draining centrifugal G forces. From the start he hoped to do this by the application of suitably graded counterpressure from feet to chest. He saw this acting in a graded fashion like a man wading into water up to his chest. The benefit from the early CAAG (Cotton Aerodynamic Anti-G) suits was variable and the major factors operating were thought to be
prevention of venous pooling and fluid extravasation into the tissues. However, these two physiological effects take some time to develop and are not now considered to be the most important results of the brief exposure to radial acceleration experienced by fighter pilots. An effective anti-G suit not only balances the intravascular pressures but also compresses the arteries, raises the peripheral resistance and the blood pressure at heart level. The head level arterial pressure also rises and brain perfusion is increased. In fact, wearing a G suit produces most complex effects and their study is a stern exercise in human physiology. However, Professor Cotton’s early CAAG suits worked and they gave G-protection to at least 2 G level. The suits were lighter and considerably more practical than the Franks’ suits. The following extracts are taken from Professor Cotton’s paper “An Aerodynamic Suit for the Protection of Pilots Against Black-out” published in The Australian Journal of Science in June 1945.

“General Description of the CAAG Suit.

This consists essentially of a series of overlapping rubber sacs incorporated into two separate “leggings” and a pair of “shorts”. The “leggings” extend from the soles (or from the ankles in different modifications) nearly up to the top of the thigh. Each “legging” contains four of these rubber sacs and the “shorts” contain two, the lower one covering the lower part of the abdomen and extending into the legs of the shorts and the upper one extending up to the lower borders of the ribs. Zip fasteners are placed in suitable positions. Each rubber sac is so arranged that when inflated an inextensible fabric in its outer wall prevents it expanding outward while the coating of fabric on its inner wall permits it to expand against the skin and to press upon it to afford a smooth support. The material is as durable and fireproof as possible.

By the use of an appropriate set of valves automatically operated by the centrifugal force of the turning aircraft, air is led into each of the air sacs and produces in them a pressure which is closely proportional to the G force applied. The final valve used, called the Myers valve, has the special advantage of cutting off the gas supply when the suit is filled and reduces the gas requirements to a minimum. This permits the use of a small CO₂ cylinder as gas supply, which is more than sufficient for the number of inflations normally required for one combat flight. When the centrifugal force comes off, on resumption of straight flight, the gas escapes again automatically from the sacs, restoring the contents to atmospheric pressure. A device is placed in the line of gas supply whereby the suit can remain uninflated up to any predetermined value such as 1.5, 2 or 2.5 G, and is filled only when the centrifugal force exceeds this value.”

The human centrifuge at Sydney University had been completed and operational by the middle of 1941 and with the co-operation of Dunlop Rubber Australia Ltd the CAAG suit was officially ready for operational trial in the RAAF in 1942. A Wing of the RAAF at Darwin under the command of Group Captain C. R. (“Killer”) Caldwell was trained in its use. To the great disappointment of the pilots it was not put to use in combat as the Japanese attacks on Darwin ceased at about that time. The use of the Australian manufactured CAAG suit was not pushed and simple, univalve, single pressure air bladder, suits were developed and manufactured in the USA. These were later used extensively in the Pacific and European air wars. Cotton’s work and his visit to Canada and the United States in 1942 was of major pioneering importance and triggered rapid development in the field.

Compressed air storage bottles had to be carried in the piston driven aircraft such as the P51 Mustang (unlike the present day feed off the jet compressor). In the last year of the war a flight surgeon in the US 8th Air Force reported that the pilots in his P51 Mustang fighter group had their G suits, on average, inflated 3-4 times during escort duty with the big bombers over Germany—and with much higher frequency if they had been engaged in combat with German fighters. These Mustangs could structurally tolerate about 6-7 G without damage. The catch was that wearing G suits the pilots could tolerate 8 G without blacking out. Break up of the aircraft could occur in the tight manoeuvres which could cause enemy pilots to black out. On percentage however an extraordinary advantage had been given to the allied fighter pilots.
Classical serendipity had operated in stimulating Cotton's enthusiasm to produce his suit. He had had the right training and general background in human physiology and was triggered into action by a chance event—the reading of a small item in a newspaper.

In an interview in People on 28 July 1954 Professor Cotton described his stimulus to begin the research . . .

“One night in 1940 I was sitting quietly at home reading the paper when I noticed a small item from London. It simply said that blackouts were proving a crucial element in aerial combat and were causing the authorities concern. I read it and inside one minute I could see the solution. It was simply a matter of combining applied dynamics that I had learned at school, and physiology. I made up my mind to have a go at it.”

People went on to comment:

“His first enquiries suggested that although there had been much research into blackouts and their prevention there had been none on the line he had conceived. The Anti-G suit research commenced with the purchase of two women's rubber bathing costumes, these were cut and cemented to rubber sheeting to form a number of air sacs for the first suit. The construction of the human centrifuge followed. It consisted of a tunnel-like structure about 18 ft long and 4 ft high mounted on a turntable which at first turned slowly then increased its speed to a maximum of 60 revolutions a minute. Lying in this whirling apparatus, speaking through a telephone to his colleagues outside, the professor reproduced the symptoms he would have suffered flying a fighter plane thousands of feet up.”

The machine was built with funds provided by the RAAF (Flying Personnel Research Committee headed by Air Vice-Marshal T. E. V. Hurley) and some contributions from the National Health and Medical Research council of Australia. The actual construction was undertaken by White Elevators of Sydney, to designs by Mr C. W. Prescott. The manufacture of the CAAG suit was made a practical possibility by the cooperation of Dunlop Rubber Australia Ltd. Dr D. M. Myers of the National Standards Laboratory finally designed a most ingenious and economic valve
which replaced the first one designed by Professor Cotton himself. Professor Cotton was given major assistance by the RAAF. The Chief Test Pilot for the project was Sqn Ldr K. V. Robertson, AFC and Sqn Ldr A. K. McIntyre and Flt Lt G. Ellis played major roles.

The importance of the research was soon recognised officially in Australia and overseas. Professor Cotton was requested by the Government to confer with research teams in Canada, US and England shortly after the first tests on the suit were completed in 1942.

He enthusiastically recorded, "At 12.05 am, five hours before my plane was due to leave, we got the final, conclusive, proof; the centrifuge created in my body forces far greater than those experienced in an aircraft and the Anti-G suit completely protected me from blackout."

There has been little real change in the design of Anti-G suits since the end of World War II. The RAAF CSU-3/P Anti-G garment is identical to that used in the USAF. It is worn by pilots in our first line Mirage and F111 aircraft, as well as by the pilots in the Macchi jet trainers. The suit has a simple, five air bladder system inflated through a single cockpit valve, with a quick-disconnect lock. The gas line leads off the jet compressor via a cooling heat exchanger. Graded inflation of the bladders as suggested by Professor Cotton has remained under consideration, but fear of equipment complexity has retarded this development. Producing durable, comfortable fire resistant fabric for the suits has also been a problem. The new fire resistant NOMEX material is at present being examined, as a replacement, for the cotton-nylon in standard use. The air is metered to the suit by a single cockpit valve which initiates inflation when the acceleration exceeds 2 G and the inflation increases with further acceleration.

It was most interesting to hear recently that a new suit with graded inflation features may appear as an RAAF service modification later in 1978. This suit will incorporate the Cotton idea of sequential inflation of the bladders in the order of calf, thigh and abdomen and it is believed that this will significantly add to G protection for the pilots.

A sample of the fine tribute paid to Professor Cotton at the end of the war was that of Professor John F. Fulton, Sterling Professor of Physiology at Yale University. In the introduction to his Heath Clark lectures on "Aviation Medicine in its Preventive aspects — an Historical Survey" delivered at the University of London in 1947 he paid particular tribute to Professor F. S. Cotton of Australia in the following terms: "My lecture is a record of positive research achievement based on international co-operation; on account of this circumstance, and the fact that individuals have so often submerged their personal contribution for the common good, it has often been difficult to assign credit for a given advance.

The anti-G suit is a case in point, for while Captain John Poppen, MC, US Navy originally propounded the idea of a pneumatic belt, the suggestion of gradient pressure protection for the lower extremities came from F. S. Cotton of Australia, and the proposal for combining all forms of pneumatic protection, i.e. belt, leggings, sleeves etc., into a single lightweight garment, appears to have originated simultaneously in New Haven and Sydney, the American proposal having come from Mr Fred Moller, the resourceful designer of restraining garments for Spencer Inc., and the Australian from Professor Cotton of Sydney."

Acknowledgements

I wish to record my thanks to Air Vice Marshal D. A. S. Morgan and his staff at Directorate General of Air Force Health Services, RAAF. In particular Lt Col J. E. Fox, USAF for supplying valuable information on recent developments in Anti-G Garments. Dr Brian Cotton provided valuable background material on his father's life and work.

REFERENCES

Major General Ronald Hopkins  
CBE, US Legion of Merit, pso

GENERAL Sir Edmund Allenby, Allied  
Commander-in-Chief in Palestine 1917-18,  
hoaxed the Turkish commanders on a  
giant scale. It was one of the classic examples  
of deception in war. In every way, during the  
previous 18 months, he had encouraged his  
enemy to believe that the Allied main strength  
and future offensive intention lay on the open  
eastern flank. This policy was so effective that  
in September 1918 General Allenby had  
secretly concentrated five infantry divisions on  
a narrow front of eight miles in the coastal  
sector on his extreme western flank. They were  
backed by three mounted divisions concealed  
in the orchards and orange groves north and  
east of Jaffa.

In the Jordan Valley, only the Anzac  
Mounted Division and a somewhat mixed  
group of infantry were left to maintain the  
impression that they were a powerful force  
poised for attack. This was Chaytor's Force.  
It took its name from its commander, Major  
General E. W. Chaytor of the New Zealand  
Permanent Forces. General Chaytor originally  
commanded the N.Z. Mounted Brigade. Later,  
he took over the Anzac Mounted Division  
which contained the 1st and 2nd Australian  
Light Horse Brigades and the N.Z. Mounted  
Rifles.

So confused had the Turks become with the  
many features of the brilliantly conceived de­  
ception plan that they had posted roughly one  
third of their total force in the Jordan Valley  
and the hills east of it while the remainder  
were spread thinly along nearly fifty miles of  
front stretching to the Mediterranean coast.  
When most of our mounted units moved from  
the Valley to join the concentration of force  
behind the opposite flank, they not only left  
dummy horses and camps behind them but the  
Anzac Mounted Division had to take over all  
their positions and patrols so that the enemy  
would not notice any reduction of effort. This,  
after a long, exhausting summer, meant that  
the troops were working almost day and night.  
Moreover, there was quite a considerable risk  
of the Turkish forces, in greater strength, stag­  
ing an offensive of their own to forestall the  
Allied drive. Tension was very high amongst  
our troops in the Jordan sector until, just before  
dawn on 19 September, we saw the western sky  
lit with huge flashes as the initial bombardment  
of 300 guns got under way. Only then did we  
feel secure; once the Turk realized that he had  
been the victim of a confidence trick, and that  
our main thrust was already taking place in the  
distant coastal sector, he could only think of  
withdrawal.
Chaytor's Force was not nearly strong enough to drive the enemy from his well-prepared positions facing us in the foothills across the Jordan plain. We had to wait for him to retire. To be sure that no time was lost, our patrolling by day was intensified while each night we junior officers took out our troops and lay as close as possible to the Turkish positions. We would unroll about five miles of telephone wire behind us in order to get a message back immediately we detected the sounds of retreat.

At last, on the night 21/22 September, we heard the unmistakable rattle of transport wheels and the chase was on. General Chaytor attempted to cut off the main body of the Turkish force by sending parts of the Anzac Mounted Division around both flanks while the infantry of the force, consisting of the 20th Indian Brigade and two battalions each of Jews and British West Indians, with engineers, artillery and transport took the only road winding up the precipitous hills to Es Salt and Amman. Of the mounted troops, the New Zealanders and the 1st A.L.H. Brigade struck for Es Salt through most difficult country about fifteen miles north of the road. The 2nd A.L.H. Brigade took the Ain-es-Sir track on the southern flank leading direct to Amman. One squadron from the latter Brigade ('C' Squadron, 6th A.L.H. Regiment) provided the advanced guard and cleared the way for the infantry and wheels up the main road. This was the squadron I belonged to so that, at the head of the whole advance, the initial responsibility seemed to rest squarely on me and my 'B' Troop.

Crossing the Jordan plain in the very early morning my first alarm came from about twenty of our heavy bombers. They might easily have mistaken us for retreating Turks. To make sure, I trotted the troop round and round in a circle (the Air Force insignia) until one of these giant aircraft dropped down a few hundred feet and gave a slow and stately waggle of his wings to acknowledge my message. Then we plunged into the Shunet Nimrin gorge, climbing up a rough road literally cut into the mountainside with the Wadi Nimrin trickling over the stones some hundreds of feet below.

There was every evidence of flight. Discarded vehicles, crates and boxes, and on its side in the wadi below, 'Jericho Jane', a large calibre gun which had stirred us up fairly frequently in our daily activities in and around the river. I was glad she was finished. I remembered very vividly one occasion when our squadron had been returning from a minor foray across the featureless plain east of the river. We were spread out by troops in depth and moving at a walk when this large gun started taking pot shots at us. We still had a couple of miles to go to reach the bridgehead; every couple of minutes we would hear the gun fire behind us and a shell would land either just in front of one troop or just behind another. Our squadron leader must have thought little of Turkish gunnery because he rode quietly on without seeming at all worried by these considerable explosions. Fortunately, his confidence was unshaken and we got back in one piece.

Inevitably the road had been mined. Several times we saw where holes had been dug and once there was also a pile of explosive by the roadside. Soon we found that the road had disappeared. Charges had been blown where it rounded a spur with quite a precipitous drop below. Back went one of my troopers with a message giving the extent of the damage and on we pressed, dragging our horses up some very steep slopes until we were able to slither down to the road again beyond the break. Everywhere there were Turkish soldiers; standing beside the track and holding up their arms, popping out of bushes on the hillside, calling out to one another. All were armed with bandoliers full of ammunition. None looked in the least dangerous. But my job was to get ahead; I had no time for prisoners. Our chaps would just give a cheerful wave towards the rear and press on.

There was one bridge over the Wadi Nimrin in the twenty miles or so to Es Salt. It was perhaps forty feet above the water. The road dropped down to it and climbed away on the opposite side up a wide rocky slope dotted with plenty of bushes to conceal a party of engineers. It was not possible to spot any explosive charge from our side. I feared trip wires as there was no movement on the hill beyond. Leaving my Troop Serjeant, Serjeant McNair, with the troop and instructions to dismount the Hotchkiss gun* in case a target should appear, I took one of the corporals and we walked, or rather crouched low, one on

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*A .303-inch light M.G. carried on a packhorse.
either side, until we had come to the end of the bridge without finding any trip wire. Miraculously, too, the bridge had not been blown up. Privately, I had thought it most unlikely that anyone would press the button for only two of us! But at one moment, halfway over, a loud shout came from the opposite hill and my heart turned a somersault. Quickly Serjeant McNair brought the troop across and we discovered that a charge had been laid but not wired up. This was real luck and showed how quickly the enemy was moving.

The good news was sent back to the main body and we soon reached Es Salt, a mountain village or small town, with its streets choked with Turkish transport. All the horses or mules had gone. Some carts were overturned and possibly most of them had simply been deserted by their drivers under our air attacks. There was no sign of the New Zealanders nor of the 1st Australian Brigade. I believe they found the going very hard indeed. Our chaps had a short break here while another success message went back and we boiled our quarts. Someone found some tins of a meat and vegetable ration in a Turkish cart; it was very palatable and a pleasant change from the eternal 'Fray Bentos' bully beef. I poked around a little and came across a few maps of the area north of Amman. These, of course, were printed in Turkish but the Hedjaz railway and the configuration of the country were quite understandable. Later, when Divisional Headquarters caught up, I passed these in and received a pat on the back. It seemed that they were the only maps we possessed of that area; although there were air photographs, the maps were much easier to use. The absence of maps is, perhaps, not to be wondered at. When our advance reached the Jordan early in 1918 the only map had been re-printed from one prepared by Lieutenant H. H. Kitchener, Royal Engineers, when, presumably, he was on loan to the Palestine Exploration Committee or some such civilian organization in the eighteen-seventies. Later, it was overprinted in purple ink giving corrections calculated from air photographs but only minor errors were disclosed.

Soon we were moving out of Es Salt and heading for Amman. The country was much easier. We seemed to have reached a tableland and made good progress. Amman was scarcely ten miles away and before long we heard sounds of firing. It proved to be our own 2nd Australian Light Horse Brigade who had made a fast move up the Ain-es-Sir track and were now engaged with the Turkish rearguards. It must have been only token resistance because we were in the town before darkness set in and foraging round to find some grain for our poor old horses. There wasn't much organization. 'Sauve qui peut' was the order of the evening. I found a cache of barley in a house near the old Roman amphitheatre and put my very tired troop to sleep in an open space (a foot thick with dust) beside the main road in the middle of the town. Turkish prisoners tramped through all night but we were past caring.

Our Brigade had a day's rest outside Amman while the others chased Turks up the railway to the north where Damascus lay nearly 200 miles farther on. They told me afterwards that they had used the maps I had found in Es Salt. Next afternoon we were suddenly alerted. A large body of Turks had appeared about twenty miles to the south at a railway station named Ziza. These were supposed to be the Turkish 4th Army garrisons from Maan and other localities down the Hedjaz railway in total
We must have been on the road in little more than half-an-hour and made pretty fair time as we needed to reach Ziza well before dark. What an amazing sight it was when we arrived. The Turks had dug perimeter trenches which they were occupying. We were let through into the centre when it was explained that the Turks were very much afraid of Arab forces which had been following them for some days. The Turks had been hoping to get to Amman but the Arabs had been cutting off stragglers, sniping every night, and now looked so menacing that the Turkish commander decided to halt and prepare a defensive position. The Arabs were, in fact, our Allies—the troops of the Hedjaz whose ruler was being advised by Colonel Lawrence, the British Arab expert. Lawrence had gained their confidence and was fighting a guerilla war on the Turkish desert flank.

The Turks at Ziza claimed that our Brigade was not strong enough to protect their 6000 men and defend ourselves; it was true enough that our strength was very low through the ravages of malaria but we had only the Turk’s word for the strength of the Arab forces. Our Brigadier, Granville Ryrie, finally agreed that the Turks might keep their arms during the night on condition that they surrendered properly the next morning! In the meantime, they remained in occupation of the perimeter and, in fact, kept up a heavy fire with all weapons all night. One would imagine that no Arab, no matter how venturesome or how keen on loot, would risk coming within a mile of the fusillade.

Within the perimeter was the small railway station building, several train lines and quite an amount of rolling stock with three engines. In and around were groups of Turkish soldiers, all fully armed, squatting on the stony ground, cooking, sleeping, talking just like soldiers anywhere. Our Australians simply joined the fairly peaceful scene. My chaps kept their horses saddled and slept each beside his horse. But we also lit fires and cooked a meal. Soon a few wandered over to the nearest Turkish group offering, no doubt, to swap an English penny for a Turkish sovereign. We quickly learnt that the Turkish for ‘No’ is ‘Yok’. Although the firing around us never stopped, we all settled down in the middle, Turks and Australians, with complete trust. This was perhaps the most interesting aspect. Our feeling for the opposing army had always included admiration for their fortitude, appreciation of their fighting qualities, and a certainty of their honesty and straight dealing. This had built up through the years, starting on Gallipoli; now as the end of the war was in sight we felt that we knew each other well and appreciated each other’s qualities.

Next morning our squadron was sent out early to assess the Arab opposition and occupy a position from which we could give warning and cover any approach from the south. We spread out over a wide front but saw little at first. Behind us, the rest of the Brigade supervised the collection of weapons from the Turks and started them on the long march back, first to Amman, then no doubt to Jerusalem and finally perhaps to Egypt where most of the P.O.W. camps were established. Later in the morning, impelled perhaps by the sight of so much loot “on the hoof” so to speak, many groups of Arabs began to close in a bit. Some of these would have been 100 strong; most were mounted on camels. I dismounted my troop and we let off a few shots as a warning. They sheered off and we were soon on the road back to Amman. It was then I realized that I had no souvenir of any kind to show for all this extraordinary series of events. A large section of the Turkish 4th Army was marching away so I walked over and suggested to one of them that he might surrender his belt to me. It had the square brass buckle plate that carried an embossed crescent and star which was the Turkish badge. Recently, I unearthed it. The leather of the belt had lost its suppleness in fifty-nine years, and has been replaced, but the badge shined up most handsomely. I hope my grandson will wear it for many years to come. And I should like to think that the old Turk had been able to borrow a piece of string from someone before he got back to Amman.

No account of Chaytor’s Force would be complete without reference to the occupation of the Jordan Valley by the Anzac Mounted Division during the six hottest months of the year with only one short break. The locals had said that no white man could live through a Jordan Valley summer. It lies thirteen hundred feet below sea level and is enclosed by mountains rising more than 4000 feet above the Valley floor. The high humidity from the proximity of the Dead Sea increases the burden...
of daily temperatures exceeding 120 deg. F. Malaria was rife. Control measures did much in rear areas but in the country where we patrolled, dug trenches and put up wire entanglements each night, the mosquitoes rose in clouds from every bush. Atebrin still had to be discovered. Casualties from malaria were bad enough throughout the summer but hundreds more went down with it when we climbed 3000 feet in one day into the mountains of Moab. My own troop, having a normal strength of about thirty, went into action at Amman with five NCOs and nine men. Because of malaria, most regiments were forced to let loose the horses for which there were no riders and drove them behind like a mob of cattle.

While this was going on, the final victory over the Turks was being won on the coastal flank. The Desert Mounted Corps, containing the 4th and 5th Cavalry Divisions and the Australian Mounted Division, sped through the gap made by British infantry in the final assault and debouched onto the Plain of Esdraelon.

British yeomanry and Indian regulars were represented in the two cavalry divisions; the whole formed the largest mounted force in the history of modern warfare.

SELLING THE SERVICE

Might it possibly be that in trying, nowadays, to sell its attractions to young men, the Service is on the wrong tack by over-emphasis on what they might get out of it, and lack of emphasis on what they are expected to put into it?

Watch the Officers! by “Camomile” in The Naval Review (UK).
Job Satisfaction in a Changing Army

Major P. R. Hudson
Australian Army Psychology Corps

“We are in a race between rising levels of uncertainty produced by the acceleration of change, and the need for reasonably accurate images of what at any instant is the most probable future.”

Alvin Toffler.

In the last six years our small army has undergone a number of substantial changes affecting its structure, goals and the needs of individuals within the organisation. Close on the heels of the cessation of hostilities with Vietnam came the termination of National Service, significant events, not only for the military, but for the civilian population as well. However, there were further changes yet to come which especially altered the Army structure. Initially the ‘Hassett Reorganisation’ created much shuffling in the corridors of power, only to be compounded by the adoption of a ‘Functional Command’ system shortly thereafter. Sprinkle over these changes the significant political altercations which were near their peak at that time, the oscillations in foreign policy and military deployment, add the final ingredient of centralized control of the three Services in a single Department of Defence, and one is left with the feeling of having engaged in making and eating a goulash recipe; it may have made the Army look all right but has given the participants terrible indigestion.

The discussion in this article is about the individual within the Army and how he has reacted to these changes. How does he see his peace time role? How do work values blend with his social needs and what makes him want to strive to improve his career as well as supporting the changing Army to achieve its objectives? By reviewing the research which has been undertaken in this regard, it may be possible to specify a clearer route which the Army should take if it is to cope with the complications associated with change and job satisfaction.

Herzberg and Rafalko criticise management for a piece-meal approach to effecting job satisfaction and go on to suggest that it is generally tackled on a less than systematic basis. I would like to add to these two authors’ criticisms, and suggest that job satisfaction is too often examined only when change has created a critical state in the functioning of an organisation, in that factors such as staff turnover, absenteeism or whatever, become apparent. That is, management’s action is contingent rather than preventive, and thus is more prone to react to symptoms and not the real causes of the apparent lack of job satisfaction. To a

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Major Hudson graduated from OTU Scheyville in 1968. As a psychologist in the AA Psych Corps, he has had a variety of postings, including New Guinea and as the Officer Commanding 1 Psy Ops Unit Vietnam in 1971. On his return he served in HQ Trg Comd as a staff officer for the training systems section. During 1976/77 he attained his Master's degree from research conducted in the RAN in the training technology field. He is currently serving as OC, 17 Psych Unit, Kapooka.
large extent the same accusation may be levelled at the Army, especially with the unhappy realization that change has led to a great deal of turbulence in the last few years.

Reactions to Change

The Greek philosopher Anaxagoras (circa 500-420 BC) put forward the dictum, "All things are in a state of flux", the corollary being that the only constant aspect in our lives is change. But the rate of change has usually been slow, it is with the acceleration rate experienced in the 20th century that Toffler's "strategies for survival" are needed if the individual is to be able to deal with the problems of adjustment to such rapid change. But most of us are reluctant to react to changed situations. Why is this? Mager suggests that:

"Often people cling to the old because there is no real reason, no favourable consequence to them, for doing it the new way. It is more comfortable, more pleasant, more rewarding to stay with the old."

Opposition to the introduction of some new idea, or thing, does not usually manifest itself in active resistance. However, there is substantial psychological evidence to support the idea that behaviour variations to occur due to disillusionment, resentment and frustration, arising from an inability to satisfy needs. The blocking of goal or need achievement is quite often the result of some change occurring in the work situation. The degree of frustration depends upon four factors, these being: an individual's tolerance; his previous history of frustration experiences; his interpretation of the situation; and the pressure under which he is functioning at the time. The reader may recognise some of the following reactions to frustration, personally experienced or seen in others.

Aggression—this is often revealed in excessive criticism of management, malicious gossip and the voicing of superficial grievances. Aggression may lead to actions when intentional damage to equipment takes place; coupled with this, militant political attitudes may be held and voiced, and absenteeism, accidents and low morale become common within an organisation.

Regression—a return to more childish behaviour leading to hypersensitivity and, in the case of some managers, a refusal to delegate. Stupid generalisations and the inability to distinguish between reasonable and unreasonable requests permeate throughout an organisation when regression follows frustration.

Fixation—the compulsion to continue with the same type of action which has no useful value. The Army may rationalise this way under the pretext of maintaining its traditions, whilst civilian industry is prone to fixation as demonstrated by the continued clashes between management and shop stewards over matters which bear little relationship to the realities of industrial life in the 70s.

Withdrawal—the individual becomes apathetic, disinterested, not emotionally involved in an organisation and its goals. He may de-emphasise in his own mind, self growth and creativity and emphasise the importance of money and other material rewards. His reaction to frustration is one of calmly submitting.

EFFECTING JOB SATISFACTION

It would be folly in an article of this nature to attempt an in depth study of employment circumstances which are thought to result in job satisfaction. Instead, a number of key approaches will be examined which should clarify the Army position with respect to its activities, compared with those undertaken by other organisations attempting to effect job satisfaction.

Individual Differences

The factors which lead to a state of high morale are many. A very important factor in this context may be defined as:

"The extent to which an individual's needs are satisfied and the extent to which that individual perceives that satisfaction as stemming from his total job situation."

The much cited 'Hawthorne Studies' may be interpreted as demonstrating in part, that personalised supervision is positively related to productivity whilst several other researchers would maintain that recognition of good work is one of the key incentives in maintaining morale. The Army does this effectively, to some degree, by awarding various commendations and medals for meritorious service, and by its insistance that (in theory at least), a superior should recognise good work by his subordinates.
Herzberg, along with his confreres, is a chief contributor in recognising individual differences and their important effect upon job satisfaction. Primarily, the approach centres on the impact that job enrichment has in motivating the employee to be more efficient and effective in his job and, at the same time, receive job satisfaction. One of the earliest criterion to be used in job enrichment studies was that of pay. Such studies have resulted in vast differences in individual reaction based on age, sex, marital status, education and the like. For instance it has been found that the effects of pay vary, due to the kinds of benefits that the individual wants and needs.

Group plans for instance appear to work best for people who have strong social needs whilst only some employees respond to piece-rate incentive systems, says Whyte.

The examination of leadership, and leadership style, has been another factor included under job enrichment. Research conducted during the past twenty years reveals that there are probable gains to be made from various forms of 'power equalization': worker participation, 'flat' structure organisations, decentralization and group decision-making schemes are a few examples to be derived using this type of approach. Fiedler in his work on leadership claims there is evidence to indicate that where higher subordinate satisfaction exists, greater subordinate motivation and better decision making are some of the results derived from improved leadership. (The reader is directed to two Army pamphlets: Handbook On Leadership and Leadership—Theory and Practice, both of which expand this point.)

However, some research points out that there is at least one type of subordinate who doesn't respond in this manner; those who are highly authoritarian do not like participative management. Further to these findings, it is suggested that many superiors cannot manage in a democratic manner anyway, and with lack of response by subordinates they should not practise such a management style, regardless of the task and situational considerations. As a basically authoritarian and hierarchical organisation, the Army may well find this particular manifestation of a management problem to be common. Clearly this would allow reaction to change and exacerbate the deleterious effects of resistance to the inevitable. The means of improving selection, so that the man is better suited to the job, is another way of catering for individual differences. However in recent years there has been much disaffection with industrial psychology in that even if selection tests are valid (and this is being strongly contested), there are few, if any, which have been devised to show how well a person will fit into a particular organisation's climate and how motivated he will be.

Some recent research, in the Canadian forces, using the Vocational Interest-Career Examination (VOICE) inventory, suggests that, "there is a reliable and significant prediction of job satisfaction" and recommends operational implementation. As a further note on this aspect, there has been a move in the United States to outlaw selection tests, thus putting the onus on organisations to randomly select from among "qualified applicants".

In some work by Argyris, the needs of dependence and subordination were seen to be affected by three variables, these being: formal organisation structure, managerial control and directive leadership. These variables cause greater dependence and subordination as one descends the chain of command in an organisation. In addition, an individual seeks internal balance (usually called adjustment) and external balance (usually termed adaption) and it appears that most human problems in organisations arise because relatively healthy people in our culture are asked to participate in work situations which coerce them into being dependent, subordinate, submissive and, "to use few of their more than skin-surface abilities".

**A Merging of Theories**

In some interesting research completed recently, a parallel was drawn between what were thought to be two discrete theories related to human motivation and job satisfaction. (The theories referred to are Maslow's hierarchy of needs and Herzberg's two factor theory of job satisfaction. See additional notes.) The significant findings from this research showed that working conditions and certain attendant rewards such as going-home-time, annual leave and the like, played a major role in determining job attitudes. These factors may not lead to higher motivation and productivity levels, but do minimize turnover, maintenance of
content and provide for a stable workforce. This work adds to an increasing body of data that suggests the ‘individual differences approach’ for motivation and job satisfaction yields results which are so varied, due to changes which cannot be controlled, as to be practically useless.

**Career Planning**

Although a more formal approach to career planning and manpower utilization is becoming evident in many large organisations, the Army included, there appears to be a corresponding feeling developing that an organisation tends to do things to rather than for the individual. The suspicion generated by this conflict is the weak link in most organisation’s career planning efforts. It would seem that the crux of the problem lies with an over emphasis on selection which is ‘job’ rather than ‘career’ oriented. But does the fault always rest with an organisation? There are some authors who believe that an individual is equally to blame in the matter of career planning and development. In the Service situation, how frequently is an Army officer confused about his vocational opportunities whilst being unaware of comparative data which might help him to assess his vocational value compared to his peers? Frequently, an officer may only have a surface awareness of his personal values and needs which will probably conflict with a successful career plan in an atmosphere of change. For example, the recent changes in the Group Rental Scheme have already begun to affect the *modus operandi* of many Army officers. The tendency to settle their families in one location and avoid the penalties of a nomadic existence has become increasingly evident. The current practice of posting an officer to a variety of jobs (and locations) to gain experience for certain career streams may have to yield to postings restricted in geographical area if an officer is to remain in the Army and still derive job satisfaction.

Schonberger supports the idea that organisations have become manipulative but from a viewpoint that job/career needs are really secondary to the worker’s home and family needs. In other words, he sees the conflict between an individual and an organisation, being in terms of lack of flexibility to accommodate private life needs. The organisation is seen to be paternalistic in providing incentives such as family health insurance, housing and the like, and engenders suspicion by its over-manipulative involvement in such matters.

**Intrinsic Versus Extrinsic Factors**

In an interesting initial research programme into job satisfaction and organisational commitment in the Canadian forces, some important conclusions concerning initial employment, intrinsic (job content) and extrinsic (job context) factors were drawn. The research report revealed that the job itself (intrinsic satisfiers, primarily) was most strongly related to organisational commitment for those personnel involved in their first post training employment. While this is in keeping with other research findings related to the importance of absenteeism and staff turnover, it is alarming because of other data which show that initial employments are typically devoid of intrinsic satisfiers since they provide instead, mostly factors of an extrinsic nature. The clear implication being made by this study is that organisations should strive to orient initial employment job settings toward maximizing intrinsic satisfiers. This would necessarily entail job enrichment itself as well as providing for definite guidelines and opportunities for promotion and advancement.

**The Organisation Structure**

The very basis of the typical organisation structure may unwittingly create dissatisfaction amongst the individuals working within it. Stewart claims that if the organisation is designed on a pyramidal structure (see Fig. 1), then frustration will result for certain groups of workers whilst others may be working out of their depth. In line with this type of structure and the thinking behind it, is the inherent assumption that there are a greater number of
people of low ability and that the distribution of abilities in the human species is therefore curved (see Fig. 2).

If an organisation were structured on the basis of a normal distribution of talent, as we know really exists, then the organisation structure should be modified to a model similar to that shown in Fig. 3. The Army, through its recruiting policy, selects from only a certain proportion of the civilian population. However, the reader should be aware that within the Army, the population can be redistributed (statistically) so that the range of abilities represents the normal curve (see Fig. 3). The typical organisation structure shown in Fig. 1 is specially significant when it is realised that the Army is labour intensive rather than capital intensive in operation and is therefore based on this structure. The problem associated with the "assumed distribution of abilities" (Fig. 2) is therefore magnified to a degree because selection has previously eliminated a certain proportion of the population having very low ability. (Incidentally, the RAAF overcome this problem by enlisting direct to employments ranging from 'General Hand' through to the more technical musterngs: flexibility exists by varying the selection criteria.)

The matter is further complicated when it is realised that our education system spawns 'chief' type workers, thus necessitating governments investing in 'indian' type labour. There are several European countries attempting to cope with just this type of problem in order to avoid having to use wages to induce 'chiefs' to accept the lot of 'indians': this could only be a transitory measure and like a sandcastle, destined to crumble at the next change in tide.

**Motivation — The Key Issue?**

Management is advised, coerced and exhorted, to 'motivate' the worker so that its organisation's goals are met. However, Giblin believes there is little tangible evidence to indicate that employees are more, or less motivated now, than they were prior to job enrichment schemes being implemented. The relationship between a productivity decline and lack of a motivated workforce is also questioned in that there has been a tendency to ignore the law of diminishing returns of capital and technology in a mature industrial society. Furthermore, the huge increases in the size of organisations and a changing structure of economy have likewise been ignored by the 'experts' when considering motivation. In light of experience, there is a need to question whether most organisations really want, or are even capable of maintaining, a workforce of predominantly highly motivated achievers—they may be highly motivated, but towards anti-organisation aspects including sabotage, empire building and the like. Perhaps the theories on organisation change and personal change have over-emphasised the malleability of human beings, and the question is not how to motivate but how to facilitate and reinforce in order to achieve a reasonable and necessary level of performance. Giblin suggests a three step plan, which has considerable merit for the Army in that it reinforces many of the procedures involved in its systems approach to training (see DFJ. No. 5) viz:
• We should establish a significant degree of congruence between the individual and organisational goals. This should not be done by the ‘socialisation’ process which tends to make the individual a member of the ‘corporate family’, but by ‘accommodation’. That is, an individual’s goals will be rewarded intrinsically by achievement of his organisation’s goals, eg., by ensuring his active participation in the objective setting process, not for the purpose of satisfying or motivating but to ensure mutual understanding, necessary commitment and unity of effort.

• We should ensure that a direct relationship is perceived between performance/productivity and their level of reward—what are the consequences of striving hard? Towards this end, the following should be examined:
  — The setting of measurable goals/objectives.
  — The setting of goals at each level, and collaboration between supervisor and subordinate.
  — The communicating of goals to all levels to the degree where they are understood and accepted by a majority of the participants in the achieving of the goals.
  — The defining of the job in terms of output rather than function or activity. (This may represent a real problem for the Army when it tries to rationalise output in a peace-time role situation. However, the work done by MERIT* using ‘mission analysis’, has already faced up to this issue.)
  — The emphasising of individual accountability—again this should be in results rather than activity terms.
  — The basing of highly differentiated rewards on measurable and mutually agreed goals.
  — The relating of recognition and advancement to consistent goal achievement.

• We should work at eliminating unnecessary structural barriers that inhibit high levels of performance.

* An acronym which stands for Military Employments Research and Information Team.

In Conclusion
This article has reviewed some of the main contributions made in research into job satisfaction and how it can be affected by change. Many of the approaches have realised different results and it seems further investigation is necessary before any real trend is discernable. Despite this, I believe there has been a clearer route specified, by which the Army may tackle its problems in this matter. The suggestions made by Giblin* seem worthwhile in that they reinforce worker motivation whilst inherently coping with change which will continue to affect the work environment. It is my hope that the efforts of the Regular Officer Development Committee (or any other committee given a similar charter in the future), after having examined the career and employment of officers in the Army, will adopt steps similar to those outlined above so that some real impact is made upon job satisfaction in a changing Army.

NOTES
3. Toffler, op. cit.


43. Giblin, *op. cit.*

**Additional Notes**

For a concise explanation of the two theories concerning motivation and job satisfaction the reader is referred to the following excellent articles:


and

Corporal J. W. Clarkson  
Royal Australian Air Force

Introduction

Before any attempt can be made to answer such a question, surely one must define the obligation. It must be emphasised that in this report primary roles and obligations only are discussed.

Let us pause for a moment to discuss the importance of defining a primary role. Whilst most of us would agree that secondary appointments are a vital and necessary part of the function of the RAAF, we all must keep in mind that for each and every one of us, our primary appointment must take precedence over every other activity. It is for that reason that primary objectives only will be discussed in this report.

Once having established a definition for the primary role of the RAAF, one can then discuss the fulfilment of this role. If the present functioning of the RAAF is found to fall short of the prescribed definition, then proposals can be made toward the improvement of the functioning of the service.

The Primary Role

Much has been written in the past concerning the primary role of the RAAF. Usually when a serviceman attempts to write such a definition, the result is particularly service orientated. By the same token, when a federal politician attempts to write such a definition, the result simply transforms the RAAF into a mere extension of the Commonwealth Public Service.

To obtain a basic, unbiased definition of the role of the RAAF, one must erase all thoughts of political bias, alignment of civilian trades, all secondary appointments, and all personal and professional ambitions. One must concentrate on the primary role of each RAAF unit, then combine all of these roles to create a definition which would both accommodate and justify all RAAF units.

One such definition is quoted as:

"The primary role of the RAAF is to deliver a selected item of explosive ordnance to a selected target with precision accuracy and precision timing with the least possible warning."

To examine this definition in detail, it can be divided into five parts:

- **A Selected Item of Explosive Ordnance.** Each item of explosive ordnance has been meticulously designed and manufactured to suit a particular purpose with calculated effectiveness. Each item, whether it be offensive, defensive, life saving, signalling, or rescue in its purpose, can be relied upon for effectiveness if used within the manufacturer's recommended parameters.

- **A Selected Target.** This part is obviously the key part from which several other factors are decided. The selected target's accessibility, geographical location, vulnerability, physical size and means of support or defence are all factors which will affect the item of explosive ordnance to be chosen, the means of delivery (i.e., Type of Aircraft), and possibly the departure base of that aircraft.

- **With Precision Accuracy.** There are two particularly important reasons why precision accuracy becomes unconditionally essential. Firstly, when explosive ordnance is being delivered in support of your own ground troops, the accuracy required sometimes is as fine as 10 metres.
Secondly, in the event of a surprise attack, if the first attempt is inaccurate, then the surprise element of the attack is lost.

- **With Precision Timing.** Precision timing is necessary to co-ordinate all operational activities, be they ground manoeuvres, naval operations or airborne operations. Without precision timing, any strategic operation would come to a grinding standstill with possibly very tragic consequences.

- **With the Least Possible Warning.** This part is the real clincher. Complete books have been written just on this part. Every single defence or military operation ever practised during periods of emergency, has had this phrase as its most important factor. Each and every member of the service, from those of Air rank to the thousands of LACs, like it or not, regardless of whether his unit belongs to Operational Command or Support Command, is on a permanent re-call plan. Regardless of the time of day or night, or whether it be a working day or public holiday, each and every member should be ready to work given the least possible warning.

Once having analysed this definition in detail, one must examine its application and versatility. This definition would still apply whether it be an offensive role or a civil aid role. In the role of civil aid, one simply exchanges the part “Item of Explosive Ordnance” for a suitable part, eg. “Items for civil aid relief” or “Items of an S.A.R. kit” or “Items of MEDIVAC equipment”. The other four parts remain the same, particularly the fifth part—“With the Least Possible Warning.” History has taught us that natural disasters strike us in their fury with very little warning. History has also taught us that these natural disasters know no calendar such as we do, and therefore know no difference between working days and public holidays.

**The Present Service**

The RAAF today has become a most professional service. The service has an inventory of highly sophisticated aircraft and appropriate support equipment. The aircraft of the RAAF have performance parameters far in excess of those in the Air Force of the past. Does this imply that the RAAF is more proficient than before? Not necessarily so. Whilst the modern aircraft can achieve performance levels beyond past aircraft, the flying units of yesterday’s Air Force most definitely achieved feats which seem incredible by today’s standards.

The modern tactical offensive aircraft suffer from two distinct disadvantages. If these disadvantages were to be overcome, then the flying units as well as the RAAF as a whole could reap the full benefits of today’s sophisticated aircraft. Those two disadvantages are:

- They lack the ability to be mobilised as a squadron at short notice; and
- They lack the ability to be rapidly scrambled and subsequently turned around at short notice.

To illustrate these points, there would be quite a number of serviceman who still remember the ‘high’ exercises and the ‘low’ exercises which were ‘cranked up’ by Air Staff personnel of Headquarters Operational Command.

One would remember when a so-called ‘enemy’ was attacking Darwin Harbour, resulting in one bomber squadron and one fighter squadron being recalled and mobilised to RAAF Darwin given warning of only a few hours. One could also remember the scrambles achieved by squadron personnel of 81 Wing, 78 Wing, 79 Squadron and perhaps others who were placed on continuous five minute alert. Some of those scrambles were accomplished in less than a minute.

However, enough of nostalgia! The problem at hand is to enable today’s Air Force to achieve the accomplishments of its forebears. Given our present aircraft and keeping in mind the previously discussed definition, one finds that it would not be so difficult to meet the terms of that definition.

**The Proposed Improvement Plan**

As it would be impractical and just about impossible to mobilise a complete squadron of F111Cs or Mirage aircraft to a remote area in less than 12 hours, the alternative is to base some of the aircraft at other bases. If the facilities at RAAF Darwin and RAAF Learmonth were utilised, these bases each could become permanent hosts to a strategic offensive squadron.
The recent commendable case of forming of a squadron is that of No. 35 Squadron, Townsville. The idea of moulding two types of aircraft into one squadron should be expanded and further employed. Surely, a tactical squadron comprising of six Mirage and four F111C aircraft is not beyond the realms of probability.

A most viable group of proposals include the following:

- The re-forming of Nos 76 and 79 Squadrons to be based at Learmonth and Darwin respectively and each equipped with six Mirage and four F111C aircraft;
- The employment of No. 10 (MR) Squadron at RAAF Darwin;
- The re-forming of Iroquois Helicopter SAR services at all flying bases;
- The re-instatement of servicing crews to flying squadrons, ie. Nos 1, 6, 10, 11, 36 and 37 Squadrons; and
- The introduction, once again, of regular, but totally unpredictable squadron alerts.

The forming of the strategic squadrons at both Learmonth and Darwin would remove the problem of rapid deployment of a strategic force to a remote area. No. 10 Squadron, if located at Darwin, would be ideally situated to share the northern portion of Australia's reconnaissance. Of course, if all of these proposals eventuated, the re-formation of the helicopter S.A.R. service on each flying base would become mandatory.

To obtain the greatest amount of proficiency from any flying unit, a complete and total team effort is to be voluntarily offered from all its members. To promote such an effort, each and every member, from the CO to the LACs must have a strong sense of belonging toward his unit. Internal squadron rivalry between two or more squadrons of the one wing is most healthy and is a substantial aid to squadron spirit. When a squadron, eg. No. 1 Squadron, completes a successful operation which has lasted several days, all personnel who belong to that squadron can all equally admit that they were a part of that success. The previous administration of No. 81 Wing and No. 82 Wing can still operate successfully even though the aircraft have changed. Let us give all the crews, both the air crew and the ground crew, a chance to be on the same team. A fitter who works on a squadron tarmac, and yet does not belong to the squadron operating the aircraft, does not even have the chance to feel any identity with the squadron, and therefore does not operate at his best proficiency level. Let us bring back squadron rivalry, inter-squadron competition, not just for the air crews, but for air and ground crews as teams.

Once these squadrons are permitted to operate at their peak proficiency levels, each and every one of them must be kept continually active by various means. Firstly, the every day pressure of work must be maintained at a reasonably high, but flexible level. Secondly, flying programs must be continually varied, thereby combating complacency, familiarity and boredom. Thirdly and most important of all is the staging of a full scale squadron alert. These alerts must be reasonably regular, but totally unpredictable. The type of alert which promotes squadron spirit and promotes very high squadron proficiency is when one squadron is tasked to attack another base almost without warning, thereby attempting to catch the victim unprepared. These exercises, of course, are ideal training for both air and ground crews, should that unexpected, but horribly real attack ever occur.

Conclusions

In the past, various RAAF squadrons, both at home and abroad, have been able to very proudly boast of a proficiency and of accomplishments which have been second to none throughout the world's Air Forces. There is absolutely no reason why that cannot still be said of our operational squadrons. Other Air Forces are considerably larger, have much more equipment, and have considerably more men, but there is not one Air Force which can boast of the versatility, the meticulous quality control, or the resourcefulness of an operational RAAF squadron.

Gentlemen, the potential contained within your tradesmen, your NCOs, your engineers, and your air crew is almost immeasurable. To be perfectly honest, each and every one of us would have to confess that our unit was not operating anywhere near its potential proficiency level. There are probably countless numbers of men and women who are working commendably within the service; but more often than not, these are tremendous individual
efforts. Unless these efforts can be harnessed voluntarily into a unit team, there will continue to be an enormous amount of energy wasted.

When confronted with the stark reality of one's obligation to his or her own Air Force, the inevitable question arises:

"Am I a willing serving member of the Royal Australian Air Force, as a proficient, military force, or is the service simply a means of secure employment for me?"

Before the Royal Australian Air Force can honestly fulfil its obligations, we each must ask of ourselves the above question, then look at our own unit's role and its contribution, then ask the question:

"Am I contributing sufficiently to my unit's role?"

Gentlemen, if the Royal Australian Air Force were permitted to operate as a professional, proficient, military force, it has the potential to out-perform its rivals far beyond their wildest expectations. This Air Force does not really need to expand its present numbers or its equipment, but to simply develop the expertise and the potential we presently have.

* * *

**BOOKS IN REVIEW**

The following books have been received and are recommended. Review of many of them will appear in later issues of the Journal:


WARNING AND RESPONSE by Julian Critchley, London, Leo Cooper, 1978. (Obtainable through Methuen, Australia.)


AIR MOBILITY
a game for 100 or more players

Captain M. I. Printy*
Royal Australian Corps of Transport

AIR MOBILITY is a game of skill played between teams selected from two groups of players. The first team, entitled 'the Army', is normally represented by men of an infantry battalion. The second team, called 'the Air Force', may be drawn from any section of the RAAF Air Movements Organization. The game is played on a four-dimensional board (to be purchased separately) and involves the movement of the first team by the second from one corner ('the departure airfield') to another ('a destination'). Progress across the board will be subject to a series of handicaps.

PLAY is initiated by an external agency referred to as 'the Central Staffs'. The unit to be moved and its destination will be selected at random to achieve maximum surprise and, regardless of the notice actually available, the two teams are to be informed only at the last moment for the move to remain feasible.

Following the signal of 'play', each team then endeavours to score points off the other until either a destination is reached, the Air Force runs out of serviceable aircraft or the Army runs out of troops. The Army may also resign by adapting its exercise to the Holsworthy Training Area.

POINTS are awarded at each development in the play.

During basic planning, the Army scores 50 points if it can persuade the Air Force to emplace the unit at an airfield anywhere within convenient distance of the unit's camp. The score is doubled should this airfield be devoid of facilities or normally confined to light aircraft. The Air Force likewise may gain 50 points if the Army is forced to leave from Richmond or Amberley, the score being increased by one point for each mile by which the road journey exceeds the subsequent air move.

The payload quoted by the Army in planning should in no way resemble the freight actually delivered to the aircraft for loading. The manifests should be so worded however that no formal reproach is possible subsequently between parent headquarters. Should the Air Force be able to identify such a discrepancy it will gain 20 points, or 50 if correspondence reaches Brigadier level.

When allotting aircraft to the airlift, the Air Force gains 20 points for each Caribou or Chinook it is permitted to task in the full passenger role. A bonus is awarded for flights

* Originally published under the pseudonym PAR ONER1 in the RACT Corps Newsletter No. 9 (May 1978) and reprinted with the kind permission of the Editor of that publication. The author who describes himself as "a well known truckie who was landed at Richmond after a thirteen hour C130 flight from Singapore prior to a flight from Mascot to Townsville", has bravely allowed his name to be used in the cause of truth, thus opening himself to some very uncomfortable future flights.—Editor.
over six hours. This total score may be doubled should the Caribou be overtaken in flight by a Hercules carrying the unit’s freight, landrovers and Air Force servicing personnel.

Both Army and Air Force formations may issue conflicting orders at any stage prior to departure. Twenty points will be awarded for any major amendment so timed that the other team’s internal administration is held to blame for ignorance of a change in time, day or airfield of departure.

Experienced players will appreciate that the time of arrival of the Army unit at the airfield and the time of departure of the aircraft will bear minimal resemblance to any published information. The Army may claim one point per minute by which this time interval is shortened; the Air Force may claim one point per minute by which the Army have been made to arrive unnecessarily early. Either side may make full use of such phrases as ‘all times Kilo’ or ‘all times Zulu’ cunningly hidden as footnotes in an Annex.

The Army will be permitted to load freight onto the aircraft but the Air Force may, at their discretion, apply a handicap by insisting on responsibility for supervision. The Army is awarded 50 points for each aircraft fully loaded on time and about which the aircraft captain is unable to find a valid reason for demanding reloading or relashing. This eventuality is of course exceptional. The Air Force will normally allocate troops to individual aircraft and so ensure that no chalk is ever coincident with any recognisable sub-unit; they may then claim one point for each man separated from his company.

Each soldier is to be briefed at platoon, company and battalion level as to his individual baggage allowance and forbidden articles. This information is to be repeated by the ATLO, Army movements officer and Air Movements. Ten points will then be awarded to each soldier who exceeds his baggage allowance by at least 20% and a further ten points may be claimed by any man reaching the aircraft steps openly carrying a transistor radio, butane lighter, aerosol, etc.

In the event of aircraft unserviceability en route, the Air Force will be penalised for overnight delays at Alice Springs, Port Moresby or Townsville. Points may be recouped however if the crew manage to declare an aircraft unserviceable at Singapore, Perth or Hawaii. The Air Force may seek a bonus if in such an event they can persuade the Army to remain in the Movements lounge all day on the pretext of imminent rectification and departure. Should the aircraft finally become serviceable, points are to be doubled if insufficient crew duty time remains and a further twelve hours rest for the crew may be justified.

Further opportunities for scoring may occur with overnight delays where the Army is required to use transit accommodation. The Air Force gains one point for every man allotted to a room in excess of its normal capacity. Twenty points are granted if the unit commander and his driver are allocated to the same room. The Air Force gains a further bonus if, simultaneously, the crew can arrange accommodation at a motel in the city centre: scoring will be increased with the motel’s rating, to a maximum of 50 for the local Hilton. Most crews will of course gain on this play.

On arrival at the destination both the Army and the Air Force have equal opportunities for scoring. A prompt arrival at the destination planned is valued exceptionally highly at 50 points for the Air Force. The Army may reduce this figure by one point for each piece of baggage mislaid; this has proved to be the appropriate weighting to achieve parity. The Air Force may nevertheless claim ten points if it can be announced that the unit commander’s baggage was off-loaded at Darwin. The score is twenty if it is in fact true.

On arrival of the last Chalk, aggregate points are compared. Should the Air Force win, they may commence the return play with a 200 point bonus. Should the Army win, they may opt for a return by rail or sea. In any event the game will prove to be one of a series.

It will be perceived that the game is open to infinite variation. It is a war game that may be played throughout times of peace. It is, however, deserving of a final accolade; it completely defies operation analysis, team management or resolution by digital computer.
The Definitive Clausewitz*


Lieutenant G. J. Pemberton
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It is frequently asserted that Clausewitz, like Marx, is often quoted but rarely read. Though Clausewitz cannot boast the immense body of scholarship that in Marx’s case completely overwhelms his own output, it is somewhat puzzling that such an integral and frequent activity as war has not been the subject of more serious scholarship. There has been, of course, a consistent flow of books and articles on military history and analyses of the past arts of warfare, but most writings on war have not considered the fundamental nature of war itself. Perhaps it is as Bernard Brodie explains: “soldiers are rarely scholars, and civilians are rarely students of strategy”. Soldiers do not as a rule possess the academic training, intellectual equipment or even the inclination for the undertaking. Carl von Clausewitz, however, was both soldier and scholar and On War remains the classic text on war.

Born at Burg on 1 June 1780 Clausewitz grew up amid the maelstrom of the French Revolution and at thirteen began a close acquaintance with war which would continue until his death in 1831. He first saw military service as an ensign in the Rhine campaigns of 1793-1794 and was commissioned at the siege of Mainz. In 1803 he was made aide-de-camp to Prince August and later served in the campaign of Jena in 1806. Both he and the prince were captured at Prerzlau and he spent two years in captivity in France and Switzerland before returning to Prussia where he served as confidential assistant to Scharnhorst. When Prussia was compelled to contribute a corps to Napoleon’s army for the invasion of Russia, Clausewitz resigned his commission and in 1812 he accepted a staff appointment in the Russian army. Later he was re-admitted to the Prussian service and was present at the battle of Waterloo. In 1818 he was appointed Superintendent of the War Academy at Berlin, a post he held for the next twelve years. Today he is chiefly remembered for his reflections on his soldiering experiences but there was much more to the man. It is apparent from his other writings and his personal life that he was a person of warmth, depth and sensitivity.

Peter Paret, says that as a scholar he possessed “a pronounced sense of reality, sceptical of contemporary assumptions and theories, and an equally undocinaire fascination with the past”. Despite little formal education he was unquestionably a man of powerful intellect — a thinker. But his visionary gaze was tempered by a sense of proportion and pragmatism that demonstrated clearly that he knew himself and his fellow man equally well. It is this rare combination of philosophy and experience that characterises all his work. Clearly he would have been an exceptional man in any era, but it is all the more remarkable in view of the age in which he lived and the profession to which he was dedicated.

Clausewitz wrote widely and well on politics, history, philosophy, strategy and tactics — On War represents only a quarter of his published writings. He completed some very important studies of various campaigns as well as biographies of military commanders, including the brilliant Gustavus Adolphus of Sweden. But it is his monumental On War upon which his reputation stands. First published in 1832 it has influenced military and political thought to the present day. Why then a new English translation in 1976? Why such a formidable array of scholars to recommend it?

The translator’s note to this present edition gives the reason. The first English translation made by Colonel J. J. Graham in 1874 and republished in London in 1909 is dated in style and contains a large number of inaccuracies and obscurities. A second translation by O. J. Mattijs Jolles published in New York in 1943 was more accurate but both versions were based on German texts that deviated significantly from the original. Apart from these translations present-day students have had to rely upon the rather crude abridgement introduced by Anatol Rapoport and published by Penguin books. Consequently, in view of the resurgence of interest in Clausewitz, several scholars decided that the time had come for a new and accurate edition — the variorum Clausewitz.
The appearance of this volume follows closely on Roger Parkinson's publication of a new biography of Clausewitz and Peter Paret's *Clausewitz and the State*. This renewed interest in Clausewitz is as much the product of the wider acceptance and development of international relations and strategic studies as serious academic disciplines within universities, than as a result of more traditional historical interest. This is reflected by the interests and credentials of the three scholars who provide introductory essays to this edition. Historian Peter Paret has been writing on Clausewitz for some time and sketches the biographical, historical and intellectual context from which *On War* emerged. Michael Howard, Fellow of All Souls College, Oxford, is Britain's leading academic on subjects of a military nature. He traces the influence and impact of Clausewitz in England, France, Japan, the United States and of Germany up to the present day. Bernard Brodie of the University of California, Los Angeles, is the author of a number of works on modern war, including *War and Politics and Strategy in the Missile Age*. In the third essay he underlines the "continuing relevance" of Clausewitz in the modern world. These three excellent essays considerably enhance the value of this edition.

Clausewitz's *magnum opus* has never been easy to read, although Brodie quickly challenges the widely held notion that the ideas in it are obscure, difficult or unduly metaphysical. He concedes that the style is somewhat dated and the presentation sometimes unclear, but insists that the ideas are essentially simple and uncomplicated. Indeed, Howard offers this as an explanation of why many readers complain they have got nothing out of *On War*. In looking for revelation they overlooked its simple wisdom.

If the book is to an extent a difficult one, it is because it is like the final draft of an undergraduate's term essay; it is, as Brodie says, "unfinished and therefore on the whole imperfectly organized, often repetitious and at times even rambling". The preface explains that by 1827 Clausewitz had finished six books: his seventh and eighth were in rough draft form. Had he lived he would have revised the whole work in the light of his new hypothesis on the "dual nature" of war. Subsequently, a small proportion can be considered complete. What developed as the central themes of the work are not always to the forefront and the casual reader may be distracted by the tactical detail which occupies a substantial proportion of the work. For these reasons Brodie's exhaustive guide at the rear of the text is invaluable for drawing the reader's attention to the core of the matter and allowing him to skim profitably and safely over sections of lesser importance.

I

What then did Clausewitz have to say? Naturally enough he began in a fashion one would expect of a contemporary of Kant and Hegel in the context of nineteenth century German idealism. He asked himself what was the essence of war, or in Kantian idiom, the nature of "the thing in itself". In other words, what was it that differentiated war from other forms of human activity? For Clausewitz the answer was stark. It was violence. Violence was the essence of war as power was the essence of politics. However, whereas power was only a potential, violence was an action—an act of force upon which there could logically be no internal or self-imposed limits on its employment. As Paret summarises Clausewitz "...war... ideally should be waged with the extreme of violence—ideally because the extreme of violence accorded with its nature". Translated from philosophic to practical terms this meant that a state should enlist all the resources available to it in order to achieve the total overthrow of the opposing state's armed forces and thereby render it subject to the will of the victor. In short, war should be fought with absolute means to achieve absolute ends.

Clausewitz's concept of absolute war was very much the child of the French Revolution. Wars of the late seventeenth and early eighteenth centuries fought for limited dynastic aims conformed to the general spirit of reason and optimism of the age of enlightenment in contrast to the previous religious conflicts like the Thirty Years War. Armies were small, professional standing forces, valuable assets to the monarch and not to be squandered wastefully. Up to the Seven Years War and the Great Northern War, war was more the concern of soldiers and kings rather than the
masses. The levée en masse and the other vast forces released by the revolution and harnessed by Napoleon changed all that. The stirrings of the nation in arms heralded the coming of wars fought for the very survival of the state as seen in the Revolutionary Wars and the American War of Independence.

According to Clausewitz, if absolute war was an ideal it was also a fiction, like Plato's forms laid up in heaven. Perhaps if he had studied the campaigns of Genghis Khan and Tamerlane he might have modified this view somewhat; nevertheless he made skilful use of Hegelian dialectic as an important intellectual tool for refining his concept the distinction between war as an ideal and war as a reality. A state, he argued, could not apply violence absolutely in war because of two factors. First, there were various forces outside of man's control that interfered with the use of absolute means of force in war. Second, war was limited by its ultimate aim. It may well be waged to gain a favourable political settlement short of total victory. This dual nature of war and war's fundamentally political character was uppermost in Clausewitz's thinking.

II

Clausewitz no less than Marx recognized the vast impersonal forces that move nations into conflict. Therefore war was not fought for its own sake. Nor was it always an aberration or adventure conspired by a few ambitious leaders. It was, in fact, an integral aspect of political activity. War, however, should not be seen as an ultimate resort to achieve certain goals when diplomacy had failed, because war was an intensification and not a breakdown of the ongoing bargaining process of international relations—the aim of which was to reduce the power and bargaining position of the opponent.

The logical conclusion from this is contained in his famous statement that, "War is not an independent phenomenon but the continuation of politics by different means". This is one of the most important and misunderstood statements ever made about war. That war was a political phenomenon with political aims was well known, but, observes Paret, what was "not as readily apparent was the implication that followed if war was a political purpose, everything that entered into war, social and economic preparation, strategic planning, the conduct of operations, the use of violence at all levels—should be determined by this purpose and at least accord with it". Therefore in peace or war the demands of military necessity should always be subordinated to the dictates of policy. This was the central paradox of war: the dialectic between the forces of violence and the forces of reason.

If political goals greatly affected the formulation of any strategic plan there also were other factors that inhibited the execution of that plan. Clausewitz said: "The conduct of war resembles the workings of an intricate machine with tremendous friction so that combinations which are easily planned on paper can only be executed at great effort." Uncertainty, ignorance, confusion, fear, fatigue and error were just a few of the incalculable "frictions" or psychological factors that Clausewitz identified as critical in the conduct of war. As a consequence it was both futile and dangerous for the commander to assume that war was a precise science in which certain situations demanded set actions. Clausewitz did not eschew or underscore the importance of tactical drills or fundamental military techniques, and indeed this is the subject matter of a considerable proportion of On War. But the application of these in the chaos of war should be guided by judgement and common sense, or as Clausewitz put it, the "genius" of the military commander and not rigidly determined by a set of "correct responses". The value of this view is open to debate, but it does serve to illustrate the important distinction that while military training should be directed towards teaching the techniques, military education and theory should aim to develop the commander's judgement.

III

Complementing his attempts to systematize his reflections on war was a deep interest in the subject of theory and its function. Here he was confronted with various methodological and philosophic questions. Obviously experience was the greatest teacher of all, but where it was impractical theory had a vital role in bridging the gap. However, Clausewitz rejected the utilitarian view of theory which was so prominent in his age, especially with other military theorists such as Jomini and Bulow.
There was no direct link between theory and performance: one could be taught how to fire a rifle but not how to conduct a war. Summarising Clausewitz, Paret says that, "all that theory could do was to give the artist or soldier points of reference and standards of evaluation in specific areas of action, with the ultimate purpose not of telling how to act but of developing his judgement". The theory of any activity, whatever that activity may be, must therefore seek to discover and impart the fundamental and timeless elements of that activity and not its temporary features, even if it aimed at effective performance as well as comprehensive understanding. In war the essential elements were violence, the political character of war and the intertwined factors of "friction", chance and genius and not any "unchanging principles".

To his great credit Clausewitz regarded the teaching of history as central to the development of theory but claimed that: "History had no lessons or rules to offer the student, it could only broaden his understanding and strengthen his judgement." And he also saw the teaching of military history as holding a vital place in education of military academics.

Clausewitz's debt to Kantian logic was considerable and he freely acknowledged that the works of Montesquieu and Kant had served as models for On War. This interest in humanistic education was also guided and encouraged by his mentors, Scharnhorst and Gneisenau, who with Clausewitz were part of a broad movement to reform Prussian institutions that had stagnated since the days of Frederick the Great. All three were especially concerned to remodel the Prussian Army following the debacle at Jena in 1806.

IV

Clausewitz's theories, like those of Jomini, were in essence an attempt to systematise and analyse the art of Napoleonic warfare. The originality of his ideas should not be overplayed. They were widely shared by many European armies of that time. In Prussia the elder Moltke seized eagerly on Clausewitz's concepts of the decisive thrust, massed numbers at the decisive point and the battle of annihilation. These were the important lessons of Napoleonic warfare, but the development of the rifle after 1831 transformed the character of war and largely tended to make the tactical doctrines of Clausewitz obsolete. The increasing primacy of the defence and the costliness of frontal attacks became the outstanding features of the battlefield up to the end of the Great War. Indeed it is significant that in the American Civil War where the standard of generalship was very high, Clausewitz was largely unknown and it was Jomini's teachings that were emphasised at West Point.

But if Clausewitz's tactics were now outdated, his theory of the limited and political character of war continued to be relevant. Graf von Schlieffen, Chief of the German General Staff and one of Clausewitz's greatest disciples, fixed on Clausewitz's concept of the decisive battle of annihilation in the manner of Hannibal's victory at Cannae. But in striving for complete military victory his plan ignored several important political considerations. Gordon Craig says that Schlieffen forgot Clausewitz's wise dictum "that war admittedly has its own grammar but not its own logic . . . Schlieffen was a superb grammarian but unfortunately that was not enough". It was largely the impact of the Schlieffen plan, modified by the younger Moltke, on German, French and Russian policy that accelerated uncontrollably the whole pace of events in late July 1914. If it was not strictly speaking a cause of the First World War, it undeniably contributed to the breakdown of the peace and led Count Metternich to despair "when the statesman has to yield to the soldier in peace or war a nation is usually doomed". Though the statesman has often been a villain as much as the soldier, it is significant that it was the politician Bismarck who so skilfully demonstrated the employment of war to achieve precise political goals in the wars of the latter half of the nineteenth century.

There is a danger here of reading into Clausewitz's ideas, situations and circumstances he did not even contemplate. For this reason the influence of Clausewitz and the scope of his theories has been exaggerated. But, if his concept of the political character of war is neither original nor difficult to understand it has frequently been forgotten. Although he remained popular in Germany after the Great War, when the panzer forces returned
REVIEW ARTICLE — THE DEFINITIVE CLAUSEWITZ

manoeuvre and rapid decision to the battlefield, influential writers such as Liddell Hart completely misunderstood his great lesson: a lesson that was becoming more relevant in an age when strategic bombing, ‘home fronts’ and nuclear deterrents were bringing a state’s potential for violence that much closer to the absolute. At the same time, however, in classic dialectical fashion, the political restraints on war were becoming more apparent. In Korea, General MacArthur failed to appreciate, and far worse to accept the limited nature of the war and the restraints thus placed on American military operations. Consequently he was removed by President Truman. In Vietnam the United States Government recognized the importance of the ‘hearts and minds’ of the South Vietnamese people but became increasingly preoccupied with military measures against the will to fight of North Vietnam instead of trying to generate a viable political alternative to the Viet-Cong. But the West was not alone in this misunderstanding and Mao’s dictum that “Power grows out of the barrel of a gun” demonstrates his misunderstanding of the condition that enabled his forces to achieve victory in the Civil War in China.

Although Peter Paret applauds Clausewitz for expounding such a “consistent theory of conflict”, in choosing not to develop his theoretical framework Clausewitz did not fully explore the essential relationship between violence and power that lies at the centre of politics and conflict. This subject has been well-handled by Hannah Arendt in her appropriately titled *On Violence*. Typical of the continental approach of land-locked Prussia, Clausewitz failed to examine the impact of seapower on strategy. Furthermore, he chose not to concern himself with others forms of international violence, which are continuations of policy by other means, such as terrorism which have become increasingly more important in the present day. He did, however, make some interesting observations on guerrilla warfare. Finally, he could not have foreseen how the appearance of air power, nuclear weapons and ballistic missiles would seem to alter radically the role of violence as an instrument of state policy. But it is unfair to criticize Clausewitz on these grounds. For he elected to write only about a particular form of violence, and about a particular form of war, in a particular age now long past. As Michael Howard suggests:

Too much should not be read into Clausewitz, nor should more be expected of him than he intended to give. It remains the measure of his genius, that although the age for which he wrote is long since past, he can still provide so many insights relevant to a generation, the nature of whose problems he could not possibly have foreseen.

Clausewitz himself realized that his work was only one source of light upon the subject and he mused: “Perhaps a greater mind will soon appear to replace those individual nuggets with a single whole.” Yet this hope remains largely unfulfilled. As Brodie points out, unlike other fountainhead classics, such as Darwin’s *Origin of Species* and Adam Smith’s *Wealth of Nations*, *On War* has generated no mighty successors. Partial attempts such as Foch’s *Principles of War*, Douhet’s *Command of the Air*, Mahan’s *The Influence of Seapower on History* or even Herman Kahn’s suggestively titled *On Thermonuclear War* are either too limited in their scope or already dated in content. In terms of a theoretical analysis of warfare as opposed to a specifically historical work, it is difficult to disagree with Brodie’s conclusion that: “His is not simply the greatest, but the only truly great book on war.”

Reviewed by Captain B. Cameron, MC Royal Australian Armoured Corps

WEAPONS Technology is a second, and fully revised, condensation of a yearbook produced by the publishers in conjunction with the Royal United Service Institute for Defence Studies, London. The short introduction states that it is intended for students (of modern warfare), staff officers, writers, and journalists. Its aim is to provide sufficient information to understand the subject, whilst containing the minimum of technical jargon.

Because their needs are so different, attainment of the aim for such a spectrum of readers would be an outstanding achievement. It is not unexpected, therefore, that only a compromise solution has resulted. This does not mean, however, that no benefit is held for the professional serviceman. Rather I believe that the publication makes a valuable contribution towards the mutual understanding of the equipments and capabilities of the three Services. In times when any weapon system is a mass of complex technology, a simplified guide to basic operation, characteristics, and employment methods, is not to be disregarded.

The difficult task of arranging a comprehensive guide to the latest ‘in-service’ weapon systems, has been well handled. The book divides the material into four main categories. The first deals with Strategic Weapons, mainly as to their influence on the nuclear policies of the Superpowers, whilst the others group together the weapon systems used by each Service for particular tasks. Under “Naval Weapons” for example, Anti-Submarine Warfare and weapons for Fast Attack Craft, are discussed as separate sections. This format has necessitated a certain amount of duplication. Common guidance and control methods, for example, apply to missiles used by all three Services. This is not considered a disadvantage however, as each section is thus self-contained, and usefulness as a reference is enhanced. At the end of each category, the effect of likely technological advances are considered in relation to future weapon trends and the battlefield environment. A further bonus is the inclusion, to a limited degree, of details of Soviet weapons, plus tabulated comparisons of Soviet and NATO strengths and capabilities.

Part One, written by the Director of the US Institute of Foreign Policy Analysis, was found to be extremely interesting. It provides an illuminating insight into the background of such current affairs topics as the SALT proceedings, and the controversial scrapping of the US B-1 Bomber programme. The strategic uses of weapons systems such as cruise missiles, and Soviet ‘hunter/killer’ satellites capable of destroying ICBMs with laser rays, are described in a thought provoking manner. The adequacy of Western deterrence forces, and of arms control concepts, are questioned. In addition, speculation is aroused as to the consequences of a situation in which the US, to a far greater extent than the USSR, becomes vulnerable to nuclear devastation. It is hard to fault the presentation of this subject and for those who require a general ‘overview’ of US (and therefore to a large extent — Western) strategic policies, it is recommended.

The authors of the parts dealing with Service-related weapon systems face the ponderous task of describing highly technical equipment in simple and accurately concise terms. A further complication is the problem of maintaining logical coherence when condensing the subject matter contained in the Yearbook. Both difficulties have largely been overcome. Some minor errors due to condensation and subsequent editing do appear; however, the major shortfall is in the area of detailed technical accuracy. In this regard to describe the book as one suited for use by staff officers would be misleading.

Weapons Technology should be viewed as a means of providing a general introduction to
the vast range of weapon systems in service with the military forces of today. As such it has considerable merit and, moreover, is written in a style that is very readable.

A POOR SORT OF MEMORY, by G. D. Solomon, Canberra, Roebuck, 1978, xii and 236 pp, $10.50.

Reviewed by Lieutenant Colonel I. R. J. Hodgkinson, MBE (RL)

BRIGADIER Geoffrey Solomon's personal memoir of the Royal Military College, Duntroon, A POOR SORT OF MEMORY, belies its name, being a delightful recollection of the brigadier's time as a cadet and, on several occasions later, as a member of the staff. There is nothing poor about the author's memory, jogged no doubt by notes and diaries, for his reminiscences are refreshingly sharp and his observations, read with hindsight, point to a disciplined and careful young man who developed into a perceptive observer.

Brigadier Solomon's involvement began in 1938 when he entered the College as a cadet. It continued through several staff postings there, giving him a view from both sides of the fence. This is reflected in his restrained comments, particularly on the bastardisation problems, aired several times over the years—the most recent having been in 1969—and on the tri-service college proposal which has been bandied about for twenty years.

He sees this proposal as an "uncomfortable amalgam made partially from concessions extracted from each Service" and is not convinced that inter-service co-operation thirty years on will necessarily be better or easier (one of the advantages claimed for the proposed Academy) because a bewhiskered Group Captain and a balding Colonel shoved and pushed in the same scrum". He argues that such co-operation is more likely to be reached as a result of courses shared by officers of the three Services at later stages in their careers. Oh that Brigadier Solomon might have been persuaded to put his well-balanced and carefully thought out arguments into the recent sittings of the Parliamentary Public Works Committee enquiring into the establishment of the Australian Defence Forces Academy—Casey University!

Australia's traditional institutions have, perforce, but a short tradition with few histories, readable or otherwise, having been produced to record their family growth formally, or in the case of this book, to block in the people and the events which made this history.

RMC graduates will meet again the many people who populated the College over the years and added to the peculiar flavour of Duntroon as a tightly knit community, such as the academics of extraordinarily long standing who helped to shape the College curriculum, Traill Sutherland and Ridley Bryan. Professor Sutherland joined the staff in 1926, suffered retrenchment when RMC was exiled to Sydney in 1930. With the College, he came back to Duntroon in 1937. Except for service in the RAAF in World War II, he remained there until he retired in 1967. In 1976, Professor Bryan retired after 40 years on the staff.

Many staff members at RMC, be they academic or military, seem to assume a 'larger than life' reputation. Stories about them abound, possibly because until recently their captive audience of cadets had neither the time nor the income to indulge in many activities outside the College sphere. Brigadier Solomon's book records many of these characters, giving life at this military establishment an endearingly human touch which those hundreds who served there over the years will be quick to verify.

He writes with affection of the traditions, institutions and more particularly the people who helped bring Australia's Royal Military College to its present pre-eminence in the world's military training establishments. He refers to General Sir Horace Robertson, one of the College's early graduates, and in 1938 both Director of Military Art and Commanding Officer of the Corps of Staff Cadets, for whom "there was no bushel large enough to hide his light. If one had been found, he would have been astonished and dismayed" and tells of "Red Robbie" being prescribed with a package inscribed "to the greatest soldier in the world". "On opening it he found himself looking into a mirror but was in no ways disconcerted."

One of Robbie's last pronouncements was made in Japan when he was Commander-in-Chief of the British Commonwealth Forces. Holding forth to a group of Australian service officers, including the author, he said: "I know, England knows and Australia knows". In the author's words "a memorable curtain line".
And closer to Canberra and our own times, is the line in the suggestion book in the Cadets' Mess written by Staff Cadet Russell Fox (now Mr Justice Fox), "If the food cannot be made edible, surely it can at least be presentable". His later legal judgements have been neither as short nor as terse.

A Poor Sort of Memory fills a gap in the records of the Royal Military College. It provides easy and valuable reading for those who have some knowledge already of the College and its way of life, and can be recommended for those who lack knowledge but not interest in the subject.

It is complemented by the pencil drawings contributed by Colonel G. D. W. Irvine, himself a graduate though of a later era than the author.


Reviewed by Mr T. J. Millane Services Analytical Studies Group

CHARLES GRANT in his book Battle describes war-gaming in a language that satisfies the amateur war-gamer and at the same time holds the interest of the professional. The setting of Battle is World War II and here Grant provides an opportunity for the amateur war-gamer to improve his expertise in weapons and tactics of this period (a lot of which is still valid today) without increasing the complexity of play.

For the professional student of tactics, Grant provides not only a very good introduction to war-gaming but also brings out the importance of the composition of a force which is a valuable contribution of war-gaming to training. Battle also has something to offer training centres. The rules as described in Battle could be applied to a Model Exercise in particular when presenting minor tactics to students; it also has potential in the lecture room.

Grant's description of the adjudication rules employed in Battle are very good, the most noted is the Morale rule. This rule is probably the most complicated rule to quantify and Grant's application of this rule has merit.

In summary, Battle is an excellent book for the amateur war-gamer to improve his skill and for the professional soldier an excellent introduction to war-gaming.
of some notable sea battles are very clearly presented, e.g. the Battle of Jutland and the Battle of the River Plate. Casualty figures, both military and civilian, are shown for both World Wars and the comparison between them is worthy of note. The remaining sections, covering well over half the length of the Atlas, relate to World War I, the inter-war years and World War II. Most readers will agree with this emphasis of subject matter.

Because the scales used for the maps vary considerably, as does the amount of explanatory detail accompanying each map and diagram, it is necessary to relate each map to the textual sources being used. A few maps tend to be over-simplified, perhaps in the interest of clarity. In such cases careful reference needs to be made to other sources of information.

The Atlas is complete with an index of place-names, an index of people, and an index of topics referred to in the brief notes which accompany the maps.

The case-bound Atlas is a sturdy volume, well produced on good quality paper and contains a large body of information simply and effectively presented. It will be a useful ‘companion’ to the student of military history. Overall it is a valuable work of reference illustrating more formal references with commendable clarity.


Reviewed by Captain C. D. Coulthard-Clark, Australian Intelligence Corps

Anthony Burton’s book on Revolutionary Violence produces some extremely interesting thoughts on international terrorism and the ideology of those who perpetrate it. The author opens with a longish chapter on the “State of the Art”, as he calls it. I found this part of the book fascinating and I must admit that the author’s analysis of the problem opened up entirely new aspects to me and made me realise just how shallow my own knowledge of this modern social horror was. I have a sneaking suspicion that I am not alone in this respect. Those countries who have so far been free of revolutionary violence tend to ignore the problem. One point that emerges from this book is that no nation, no society, no political system is safe from the terrorists violent attentions. These terrorists are spawned from extreme elements of both left and right and are not restricted to working class background, indeed the upper middle class seem to produce some of the worst examples, as can be seen from the Uruguayan


Reviewed by Major A. E. W. Stortner, RCT UK Exchange Officer
Tupamaros and the West German Baader-Meinhoff gang.

After this opening chapter Anthony Burton selects ten terrorist leaders and each one is used to exemplify and analyse further the evolution of revolutionary violence. The fascist theories are also dealt with and here the author warns that the Fascist threat is very real. I would suggest this point is very pertinent to professional military personnel. Military involvement in fascist theories is always considerable and vital to its survival. The slow, subtle way the military can become embroiled and used must be a cause for concern. Nazi Germany and Mussolini's Black Shirts are discussed by the author and are classic examples of this.

Lawrence of Arabia is analysed as a terrorist leader which I found a welcome change. Too often Lawrence has been simply 'knocked' as an eccentric weirdo and the film about him did much to foster this image of him in the minds of the general public. In fact as we learn in this short but informative chapter Lawrence was an extremely astute guerrilla leader who as the author puts it "combined violence with deception, espionage, corruption, propaganda and promises to destroy the enemy's will to continue. It is probably just as well that the majority of the fledgling terrorists elected to follow the examples of Mao and Che Guevara as opposed to Lawrence. The former two exponents of the use of violence were, in one case relevant only to China, and in the other frankly incompetent.

The book concludes with a brief chapter on the future in which Anthony Burton emphasises the international nature of revolutionary violence. Democracy must beware of opting for draconian measures to counter the threat, for this plays into the terrorists hand and "shakes public opinion forcing a polarization of opinion between liberals and conservatives".

I found the book interesting, easy to read and short enough to appeal to the general reader as well as the student. The book's main attraction and value for me was the way it simply, yet clearly, analysed revolutionary violence. It brought home to me the complexity and magnitude of this threat to free society and it stimulated me to think about this threat with a better background knowledge. Defence forces are increasingly becoming involved in countering revolutionary violence as events in Northern Ireland, Italy and even quite recently here in Australia, have shown. I recommend this book to all professional military students as worthwhile background reading. An interesting point that the author makes is that we need to study guerrilla warfare to utilize it. Mostly we study it to defeat it. It is a point that I suggest is of more than academic interest to those planning the defence of Australia.

Reviewed by Major G. L. Cheeseman
DCS Division, Department of Defence

LIKE the Report of the Regular Officer Development Committee (RODC), for which it was written, 'The Development of Australian Army Officers for the 1980s' will not be read by a majority of Army officers. This is unfortunate because this extremely important and thought-provoking survey of the developing trends in Australia's strategic, technological and social environment has wide ranging implications for the future of the Army and the development of its officers.

The book was prepared initially for a RODC forecasting study into the kind of future environment likely to confront Australia's armed forces. It is primarily concerned with describing the implications of likely trends 'in Defence policy' continental defence concepts, Army capability requirements, force structure and related technological developments'. The work is largely a summary of previously published works and works-in-progress written by members of the Strategic and Defence Studies Centre, and as such provides a useful introduction to a wide range of matters relating to the defence of Australia.

The central theme of the book is that Australia's armed forces are being confronted with unprecedented changes in their enviro-
ment. In order to retain a viable defence force, these developments must be matched by equally significant changes in the officer development system and in the basic force posture that is adopted by each Service. It is argued, for example, that the rate and extent of change of technology means that present ‘strategies, doctrines, tactics and force structures are all being subjected to increasing pressure to change and the nature of conventional warfare, as it has been known in the past, is being changed fundamentally’. The requirement to re-orient our strategic thinking towards the defence of the Australian mainland, and the need for increased self-reliance in defence, requires ‘radically new ways of thinking and a restructuring of the Australian force posture’. The increasing relevance of a ‘total defence’ concept for Australia will continue the civilianisation of the military, with its attendant social consequences, and will require officers to specialise in skills that are not related to the ‘application of violence’.

In the face of such fundamental and far-reaching changes, it is not surprising that the authors warn of the distinct possibility that the present officer development system will become obsolescent. The recommended changes to help avoid such a situation include increasing the technical competence of regular officers, increasing the number of highly trained specialists, broadening the occupational distribution of the officers corps beyond the narrow confines associated with the application-of-violence, introducing some form of career streaming and providing officers with a liberal education to serve as the basis for their future development. The sheer weight of evidence in favour of such changes and the recent groundswell of opinion in support of these types of reforms, particularly from within the Services themselves, will probably mean that the authors are unlikely to be severely disappointed by the Army’s response to their or the RODC’s suggestions on these matters.

The arguments presented to illustrate the need for fundamental change in the Army’s present force posture, however, are extremely persuasive. The increased precision of target acquisition and guidance systems over extended ranges and the greater destructive potential of new generation conventional warheads would seem to increase the vulnerability of large and highly concentrated formations, especially those ‘with long and conspicuous logistic tails’. The likelihood of future operations being fought around the clock, and the highly destructive nature of modern warfare, suggests that the Australian Army should be adopting a force structure based on smaller and more independent combat units.

Based on these and other arguments, the authors conclude that, while ‘there may be scope for retention of the traditional divisional concept for part of our ground forces, future training programmes should also recognize that the trend for combat arms in intense conflict, especially the infantry, will be towards operating them as much smaller groups of a number of arms with a greater delegation of command and control than at present, and considerably less reliance on the day-to-day logistic re-supply of large tonnages’. Such a conclusion would seem to have serious implications for the presently evolving concept of operations which is based on deployment of the infantry division.

It is considered that this excellent book should be made compulsory reading for all Army officers, and that it could readily replace less topical subjects presently covered by promotion examinations or at Staff College. For those who may tend to dismiss the findings as mere academic theorising (in spite of the credentials of the authors), they should bear in mind the authors’ warning that under the present rate of change of technology, ‘the yardsticks of previous experience and the supports of old-fashioned operational methods will be of little use. Officers will have to rely much more on their own judgements of the requirements of each particular situation confronting them and they are going to need a wide stock of knowledge and confidence in their ability to handle these problems if they are not going to be beaten by a better competitor in the form of an outside enemy’.
## Part 1 - TITLE INDEX

<table>
<thead>
<tr>
<th>TITLE</th>
<th>ISSUE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Mobility — A Game for 100 or More Players</td>
<td>13 Nov/Dec</td>
<td>45</td>
</tr>
<tr>
<td>Airships — Prejudice versus Potential</td>
<td>11 Jul/Aug</td>
<td>49</td>
</tr>
<tr>
<td>Armour and the Spanish War</td>
<td>9 Mar/Apr</td>
<td>53</td>
</tr>
<tr>
<td>Australian Joint Force Operations</td>
<td>9 Mar/Apr</td>
<td>12</td>
</tr>
<tr>
<td>Basic Defence Planning</td>
<td>12 Sep/Oct</td>
<td>28</td>
</tr>
<tr>
<td>Bi-Mobile Force, The</td>
<td>13 Nov/Dec</td>
<td>6</td>
</tr>
<tr>
<td>Boer War 1899-1902, The</td>
<td>12 Sep/Oct</td>
<td>38</td>
</tr>
</tbody>
</table>

### BOOK REVIEWS

<table>
<thead>
<tr>
<th>Title</th>
<th>Issue</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arms Bazaar, The</td>
<td>10 May/Jun</td>
<td>61</td>
</tr>
<tr>
<td>Battle: Practical Wargaming</td>
<td>13 Nov/Dec</td>
<td>53</td>
</tr>
<tr>
<td>Before Endeavours Fade</td>
<td>10 May/Jun</td>
<td>64</td>
</tr>
<tr>
<td>British Aviation Colours of World War Two</td>
<td>11 Jul/Aug</td>
<td>63</td>
</tr>
<tr>
<td>British Military Aircraft of World War One</td>
<td>11 Jul/Aug</td>
<td>61</td>
</tr>
<tr>
<td>Comprehensive Guide to Board Wargaming, The</td>
<td>11 Jul/Aug</td>
<td>58</td>
</tr>
<tr>
<td>Decisive Battles of the Twentieth Century</td>
<td>12 Sep/Oct</td>
<td>64</td>
</tr>
<tr>
<td>Defence of Australia, Fundamental New Aspects, The</td>
<td>13 Nov/Dec</td>
<td>54</td>
</tr>
<tr>
<td>Development of Australian Army Officers for the 1980s, The</td>
<td>13 Nov/Dec</td>
<td>55</td>
</tr>
<tr>
<td>Dunkirk: The Great Escape</td>
<td>9 Mar/Apr</td>
<td>64</td>
</tr>
<tr>
<td>Electronic Battlefield, The</td>
<td>8 Jan/Feb</td>
<td>64</td>
</tr>
<tr>
<td>Fighter Pilots of World War I</td>
<td>8 Jan/Feb</td>
<td>62</td>
</tr>
<tr>
<td>Fighting Gliders of World War II</td>
<td>9 Mar/Apr</td>
<td>58</td>
</tr>
<tr>
<td>German Generals of World War II</td>
<td>9 Mar/Apr</td>
<td>63</td>
</tr>
<tr>
<td>Great Admirals, The</td>
<td>10 May/Jun</td>
<td>63</td>
</tr>
<tr>
<td>Great Stories of the Victoria Cross</td>
<td>9 Mar/Apr</td>
<td>61</td>
</tr>
<tr>
<td>Kapyong Battalion, The</td>
<td>9 Mar/Apr</td>
<td>62</td>
</tr>
<tr>
<td>Lancaster Manual, The</td>
<td>8 Jan/Feb</td>
<td>63</td>
</tr>
<tr>
<td>Management of the Armed Forces: An Anatomy of the Military Profession</td>
<td>11 Jul/Aug</td>
<td>57</td>
</tr>
<tr>
<td>Panzer</td>
<td>9 Mar/Apr</td>
<td>60</td>
</tr>
<tr>
<td>Pictorial History of the Royal Australian Air Force</td>
<td>11 Jul/Aug</td>
<td>60</td>
</tr>
<tr>
<td>Poor Sort of Memory, A</td>
<td>13 Nov/Dec</td>
<td>52</td>
</tr>
<tr>
<td>Revolutionary Civil War: The Elements of Victory and Defeat</td>
<td>10 May/Jun</td>
<td>63</td>
</tr>
<tr>
<td>Revolutionary Violence</td>
<td>13 Nov/Dec</td>
<td>54</td>
</tr>
<tr>
<td>Road to Passchendaele, The</td>
<td>11 Jul/Aug</td>
<td>55</td>
</tr>
<tr>
<td>Royal Australian Engineers 1835 to 1902, The: The Colonial Engineers</td>
<td>10 May/Jun</td>
<td>61</td>
</tr>
<tr>
<td>Shogun</td>
<td>9 Mar/Apr</td>
<td>60</td>
</tr>
<tr>
<td>Soviet Naval Influence: Domestic and Foreign Dimensions</td>
<td>8 Jan/Feb</td>
<td>63</td>
</tr>
<tr>
<td>Submarines</td>
<td>9 Mar/Apr</td>
<td>60</td>
</tr>
<tr>
<td>Technical Change and British Naval Policy 1860-1939</td>
<td>12 Sep/Oct</td>
<td>61</td>
</tr>
<tr>
<td>These Are Facts — The Autobiography of Air Marshal Sir Richard Williams, KBE, CB, DSO</td>
<td>11 Jul/Aug</td>
<td>62</td>
</tr>
<tr>
<td>TITLE</td>
<td>ISSUE</td>
<td>PAGE</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------------</td>
<td>------</td>
</tr>
<tr>
<td>War in a Stringbag</td>
<td>9 Mar/Apr</td>
<td>58</td>
</tr>
<tr>
<td>Warships of Australia</td>
<td>9 Mar/Apr</td>
<td>62</td>
</tr>
<tr>
<td>Warships of Australia</td>
<td>12 Sep/Oct</td>
<td>63</td>
</tr>
<tr>
<td>Weapons Technology</td>
<td>13 Nov/Dec</td>
<td>51</td>
</tr>
<tr>
<td>Young Officers' Guide to Knowledge, The</td>
<td>12 Sep/Oct</td>
<td>62</td>
</tr>
<tr>
<td>Brigade for the 1980s, A</td>
<td>12 Sep/Oct</td>
<td>12</td>
</tr>
<tr>
<td>Case for Rationalization of our Defence Supply Management, The</td>
<td>9 Mar/Apr</td>
<td>26</td>
</tr>
<tr>
<td>Chaytor's Force. A Personal Account</td>
<td>13 Nov/Dec</td>
<td>29</td>
</tr>
<tr>
<td>Consider the Reverse Slope</td>
<td>10 May/Jun</td>
<td>35</td>
</tr>
<tr>
<td>Corvette — an answer to the 200 mile moat?</td>
<td>10 May/Jun</td>
<td>42</td>
</tr>
<tr>
<td>Cotton Aerodynamic Anti-G Suit, The</td>
<td>13 Nov/Dec</td>
<td>23</td>
</tr>
<tr>
<td>Courage in Captivity</td>
<td>8 Jan/Feb</td>
<td>17</td>
</tr>
<tr>
<td>Defence of Australia, The: A Bi-Mobile Concept for the Army</td>
<td>10 May/Jun</td>
<td>18</td>
</tr>
<tr>
<td>Definitive Clausewitz, The (Review Article)</td>
<td>13 Nov/Dec</td>
<td>47</td>
</tr>
<tr>
<td>Field Marshal Bernard Montgomery. A Critical Analysis</td>
<td>10 May/Jun</td>
<td>50</td>
</tr>
<tr>
<td>Formation of an RAN Amphibious Battalion, The</td>
<td>8 Jan/Feb</td>
<td>59</td>
</tr>
<tr>
<td>Future of Infantry, The — a letter to a friend</td>
<td>9 Mar/Apr</td>
<td>21</td>
</tr>
<tr>
<td>Historic Flight</td>
<td>8 Jan/Feb</td>
<td>24</td>
</tr>
<tr>
<td>History of the Australian School Cadet Movement to 1893, The</td>
<td>12 Sep/Oct</td>
<td>53</td>
</tr>
<tr>
<td>Is the RAAF Fulfilling Its Obligations?</td>
<td>13 Nov/Dec</td>
<td>41</td>
</tr>
<tr>
<td>Job Satisfaction in a Changing Army</td>
<td>13 Nov/Dec</td>
<td>34</td>
</tr>
<tr>
<td>Leadership Selection and Training: A Sociological Perspective</td>
<td>10 May/Jun</td>
<td>45</td>
</tr>
<tr>
<td>Management Game for Professionals and Sub-Professionals, A</td>
<td>12 Sep/Oct</td>
<td>32</td>
</tr>
<tr>
<td>Marine Science for Defence</td>
<td>13 Nov/Dec</td>
<td>16</td>
</tr>
<tr>
<td>Nuclear Defence for Australia, A?</td>
<td>8 Jan/Feb</td>
<td>49</td>
</tr>
<tr>
<td>Some Thoughts on a Role for Nuclear Weapons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operational Concept for the Australian Amphibious Force, An</td>
<td>12 Sep/Oct</td>
<td>6</td>
</tr>
<tr>
<td>Professional Writing</td>
<td>11 Jul/Aug</td>
<td>11</td>
</tr>
<tr>
<td>Requirements of National Strategy, The</td>
<td>10 May/Jun</td>
<td>9</td>
</tr>
<tr>
<td>Rules of War</td>
<td>8 Jan/Feb</td>
<td>33</td>
</tr>
<tr>
<td>Simulation: A Cost Effective Training Aid</td>
<td>11 Jul/Aug</td>
<td>40</td>
</tr>
<tr>
<td>Soldiers' Dilemma, The</td>
<td>12 Sep/Oct</td>
<td>17</td>
</tr>
<tr>
<td>Spy in the Sky</td>
<td>9 Mar/Apr</td>
<td>48</td>
</tr>
<tr>
<td>Stocking can be Sensible</td>
<td>11 Jul/Aug</td>
<td>13</td>
</tr>
<tr>
<td>Teaching of Australian History in Schools, The, ... The Story of HMAS Sydney and the Emden</td>
<td>8 Jan/Feb</td>
<td>43</td>
</tr>
<tr>
<td>TFF Primer, A</td>
<td>10 May/Jun</td>
<td>29</td>
</tr>
<tr>
<td>'The 100 Per Cent American' Black Jack Pershing</td>
<td>9 Mar/Apr</td>
<td>43</td>
</tr>
<tr>
<td>Time Safety Factor, The</td>
<td>11 Jul/Aug</td>
<td>37</td>
</tr>
<tr>
<td>To Military Writers: A Word from the Editor on Words</td>
<td>9 Mar/Apr</td>
<td>7</td>
</tr>
<tr>
<td>Trident of Neptune, The</td>
<td>8 Jan/Feb</td>
<td>7</td>
</tr>
<tr>
<td>VSTOL Variations</td>
<td>9 Mar/Apr</td>
<td>16</td>
</tr>
<tr>
<td>Waipa Campaign in the New Zealand Landwars, The</td>
<td>11 Jul/Aug</td>
<td>30</td>
</tr>
</tbody>
</table>
## Part 2 - SUBJECT INDEX

### air matters

<table>
<thead>
<tr>
<th>TITLE</th>
<th>ISSUE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airships — Prejudice versus Potential</td>
<td>11 Jul/Aug</td>
<td>49</td>
</tr>
<tr>
<td>Cotton Aerodynamic Anti-G Suit, The</td>
<td>13 Nov/Dec</td>
<td>23</td>
</tr>
<tr>
<td>Historic Flight</td>
<td>8 Jan/Feb</td>
<td>24</td>
</tr>
<tr>
<td>Is the RAAF Fulfilling Its Obligations?</td>
<td>13 Nov/Dec</td>
<td>41</td>
</tr>
<tr>
<td>Simulation: A Cost Effective Training Aid</td>
<td>11 Jul/Aug</td>
<td>40</td>
</tr>
<tr>
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<td>9 Mar/Apr</td>
<td>48</td>
</tr>
<tr>
<td>TFF Primer, A</td>
<td>10 May/Jun</td>
<td>29</td>
</tr>
<tr>
<td>VSTOL Variations</td>
<td>9 Mar/Apr</td>
<td>16</td>
</tr>
</tbody>
</table>

### amphibious warfare

<table>
<thead>
<tr>
<th>TITLE</th>
<th>ISSUE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian Joint Force Operations</td>
<td>9 Mar/Apr</td>
<td>12</td>
</tr>
<tr>
<td>Formation of an RAN Amphibious Battalion, The</td>
<td>8 Jan/Feb</td>
<td>59</td>
</tr>
<tr>
<td>Operational Concept for the Australian Amphibious Force,</td>
<td>12 Sep/Oct</td>
<td>6</td>
</tr>
<tr>
<td>An Trident of Neptune, The</td>
<td>8 Jan/Feb</td>
<td>7</td>
</tr>
</tbody>
</table>

### armour

<table>
<thead>
<tr>
<th>TITLE</th>
<th>ISSUE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armour and the Spanish War</td>
<td>9 Mar/Apr</td>
<td>53</td>
</tr>
<tr>
<td>Bi-Mobile Force, The</td>
<td>13 Nov/Dec</td>
<td>6</td>
</tr>
<tr>
<td>Defence of Australia, The: A Bi-Mobile Concept for the Army</td>
<td>10 May/Jun</td>
<td>18</td>
</tr>
</tbody>
</table>

### book reviews — see title index

### cadets

<table>
<thead>
<tr>
<th>TITLE</th>
<th>ISSUE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of the Australian School Cadet Movement to 1893, The</td>
<td>12 Sep/Oct</td>
<td>53</td>
</tr>
</tbody>
</table>

### history

<table>
<thead>
<tr>
<th>TITLE</th>
<th>ISSUE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boer War 1899-1902, The</td>
<td>12 Sep/Oct</td>
<td>38</td>
</tr>
<tr>
<td>Chaytor's Force, A Personal Account</td>
<td>13 Nov/Dec</td>
<td>29</td>
</tr>
<tr>
<td>Cotton Aerodynamic Anti-G Suit, The</td>
<td>13 Nov/Dec</td>
<td>23</td>
</tr>
<tr>
<td>Courage in Captivity</td>
<td>8 Jan/Feb</td>
<td>17</td>
</tr>
<tr>
<td>Definitive Clausewitz, The (Review Article)</td>
<td>13 Nov/Dec</td>
<td>47</td>
</tr>
<tr>
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<td>10 May/Jun</td>
<td>50</td>
</tr>
<tr>
<td>Historic Flight</td>
<td>8 Jan/Feb</td>
<td>24</td>
</tr>
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<td>12 Sep/Oct</td>
<td>53</td>
</tr>
<tr>
<td>Teaching of Australian History in Schools, The, ... The Story of HMAS Sydney and the Emden</td>
<td>8 Jan/Feb</td>
<td>43</td>
</tr>
<tr>
<td>'The 100 Per Cent American' Black Jack Pershing</td>
<td>9 Mar/Apr</td>
<td>43</td>
</tr>
<tr>
<td>Waipa Campaign in the New Zealand Landwars, The</td>
<td>11 Jul/Aug</td>
<td>30</td>
</tr>
</tbody>
</table>

### humour

<table>
<thead>
<tr>
<th>TITLE</th>
<th>ISSUE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Mobility — A Game for 100 or More Players</td>
<td>13 Nov/Dec</td>
<td>45</td>
</tr>
<tr>
<td>Time Safety Factor, The</td>
<td>11 Jul/Aug</td>
<td>37</td>
</tr>
</tbody>
</table>

### infantry

<table>
<thead>
<tr>
<th>TITLE</th>
<th>ISSUE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bi-Mobile Force, The</td>
<td>13 Nov/Dec</td>
<td>6</td>
</tr>
<tr>
<td>Brigade for the 1980s, A</td>
<td>12 Sep/Oct</td>
<td>12</td>
</tr>
<tr>
<td>Consider the Reverse Slope</td>
<td>10 May/Jun</td>
<td>35</td>
</tr>
<tr>
<td>Defence of Australia, The: A Bi-Mobile Concept for the Army</td>
<td>10 May/Jun</td>
<td>18</td>
</tr>
<tr>
<td>Future of Infantry, The — a letter to a friend</td>
<td>9 Mar/Apr</td>
<td>21</td>
</tr>
<tr>
<td>Formation of an RAN Amphibious Battalion, The</td>
<td>8 Jan/Feb</td>
<td>59</td>
</tr>
</tbody>
</table>

### law

<table>
<thead>
<tr>
<th>TITLE</th>
<th>ISSUE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Courage in Captivity</td>
<td>8 Jan/Feb</td>
<td>17</td>
</tr>
<tr>
<td>Rules of War</td>
<td>8 Jan/Feb</td>
<td>33</td>
</tr>
<tr>
<td>Soldiers' Dilemma, The</td>
<td>12 Sep/Oct</td>
<td>17</td>
</tr>
</tbody>
</table>

### logistics

<table>
<thead>
<tr>
<th>TITLE</th>
<th>ISSUE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case for Rationalization of our Defence Supply Management, The</td>
<td>9 Mar/Apr</td>
<td>26</td>
</tr>
<tr>
<td>Stocking can be Sensible</td>
<td>11 Jul/Aug</td>
<td>13</td>
</tr>
<tr>
<td>TITLE</td>
<td>ISSUE</td>
<td>PAGE</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------------</td>
<td>------</td>
</tr>
<tr>
<td>MANAGEMENT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the RAAF Fulfilling Its Obligations?</td>
<td>13 Nov/Dec</td>
<td>41</td>
</tr>
<tr>
<td>Job Satisfaction in a Changing Army</td>
<td>13 Nov/Dec</td>
<td>34</td>
</tr>
<tr>
<td>Leadership Selection and Training: A Sociological Perspective</td>
<td>10 May/Jan</td>
<td>45</td>
</tr>
<tr>
<td>Management Game for Professionals and Sub-Professionals, A</td>
<td>12 Sep/Oct</td>
<td>32</td>
</tr>
<tr>
<td>NAVAL MATTERS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airships — Prejudice versus Potential</td>
<td>11 Jul/Aug</td>
<td>49</td>
</tr>
<tr>
<td>Corvette — an answer to the 200 mile moat?</td>
<td>10 May/Jan</td>
<td>42</td>
</tr>
<tr>
<td>Formation of an RAN Amphibious Battalion, The</td>
<td>8 Jan/Feb</td>
<td>59</td>
</tr>
<tr>
<td>Marine Science for Defence</td>
<td>13 Nov/Dec</td>
<td>16</td>
</tr>
<tr>
<td>Operational Concept for the Australian Amphibious Force, An</td>
<td>12 Sep/Oct</td>
<td>6</td>
</tr>
<tr>
<td>Trident of Neptune, The</td>
<td>8 Jan/Feb</td>
<td>7</td>
</tr>
<tr>
<td>VSTOL Variations</td>
<td>9 Mar/Apr</td>
<td>16</td>
</tr>
<tr>
<td>NEW ZEALAND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waipa Campaign in the New Zealand Landwars, The</td>
<td>11 Jul/Aug</td>
<td>30</td>
</tr>
<tr>
<td>ORGANISATION AND PLANNING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic Defence Planning</td>
<td>12 Sep/Oct</td>
<td>28</td>
</tr>
<tr>
<td>Bi-Mobile Force, The</td>
<td>13 Nov/Dec</td>
<td>6</td>
</tr>
<tr>
<td>Brigade for the 1980s, A</td>
<td>12 Sep/Oct</td>
<td>12</td>
</tr>
<tr>
<td>Defence of Australia, The: A Bi-Mobile Concept for the Army</td>
<td>10 May/Jan</td>
<td>18</td>
</tr>
<tr>
<td>PRISONERS OF WAR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Courage in Captivity</td>
<td>8 Jan/Feb</td>
<td>17</td>
</tr>
<tr>
<td>Rules of War</td>
<td>8 Jan/Feb</td>
<td>33</td>
</tr>
<tr>
<td>SCIENCE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cotton Aerodynamic Anti-G Suit, The</td>
<td>13 Nov/Dec</td>
<td>23</td>
</tr>
<tr>
<td>Marine Science for Defence</td>
<td>13 Nov/Dec</td>
<td>16</td>
</tr>
<tr>
<td>STRATEGY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic Defence Planning</td>
<td>12 Sep/Oct</td>
<td>28</td>
</tr>
<tr>
<td>Nuclear Defence for Australia, A?</td>
<td>8 Jan/Feb</td>
<td>49</td>
</tr>
<tr>
<td>Some Thoughts on a Role for Nuclear Weapons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Requirements of National Strategy, The</td>
<td>10 May/Jan</td>
<td>9</td>
</tr>
<tr>
<td>Trident of Neptune, The</td>
<td>8 Jan/Feb</td>
<td>7</td>
</tr>
<tr>
<td>SURVEILLANCE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Airships — Prejudice versus Potential</td>
<td>11 Jul/Aug</td>
<td>49</td>
</tr>
<tr>
<td>Corvette — an answer to the 200 mile moat?</td>
<td>10 May/Jan</td>
<td>42</td>
</tr>
<tr>
<td>Spy in the Sky</td>
<td>9 Mar/Apr</td>
<td>48</td>
</tr>
<tr>
<td>TACTICS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australian Joint Force Operations</td>
<td>9 Mar/Apr</td>
<td>12</td>
</tr>
<tr>
<td>Brigade for the 1980s, A</td>
<td>12 Sep/Oct</td>
<td>12</td>
</tr>
<tr>
<td>Consider the Reverse Slope</td>
<td>10 May/Jan</td>
<td>35</td>
</tr>
<tr>
<td>Defence of Australia, The: A Bi-Mobile Concept for the Army</td>
<td>10 May/Jan</td>
<td>18</td>
</tr>
<tr>
<td>Future of Infantry, The — a letter to a friend</td>
<td>9 Mar/Apr</td>
<td>21</td>
</tr>
<tr>
<td>TFF Primer, A</td>
<td>10 May/Jan</td>
<td>29</td>
</tr>
<tr>
<td>TRAINING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leadership Selection and Training: A Sociological Perspective</td>
<td>10 May/Jan</td>
<td>45</td>
</tr>
<tr>
<td>Management Game for Professionals and Sub-Professionals, A</td>
<td>12 Sep/Oct</td>
<td>32</td>
</tr>
<tr>
<td>Simulation: A Cost Effective Training Aid</td>
<td>11 Jul/Aug</td>
<td>40</td>
</tr>
<tr>
<td>WRITING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional Writing</td>
<td>11 Jul/Aug</td>
<td>11</td>
</tr>
<tr>
<td>To Military Writers: A Word from the Editor on Words</td>
<td>9 Mar/Apr</td>
<td>7</td>
</tr>
</tbody>
</table>
# Part 3 – AUTHORS’ INDEX

<table>
<thead>
<tr>
<th>TITLE</th>
<th>ISSUE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAKER, Lieutenant Colonel J. S.</td>
<td>10 May/Jun</td>
<td>9</td>
</tr>
<tr>
<td>BARBER, Dr. L. H.</td>
<td>11 Jul/Aug</td>
<td>30</td>
</tr>
<tr>
<td>BEVERIDGE, Major D. W.</td>
<td>12 Sep/Oct</td>
<td>12</td>
</tr>
<tr>
<td>CAINE, Captain Bruce T. (USA)</td>
<td>11 Jul/Aug</td>
<td>11</td>
</tr>
<tr>
<td>CARR, Major M. I.</td>
<td>8 Jan/Feb</td>
<td>33</td>
</tr>
<tr>
<td>CHESTERFIELD, Group Captain J. M. (RAAF)</td>
<td>9 Mar/Apr</td>
<td>12</td>
</tr>
<tr>
<td>CLARKSON, Corporal J. W. (RAAF)</td>
<td>13 Nov/Dec</td>
<td>41</td>
</tr>
<tr>
<td>CRAMPTON, POETS K. L. (RAN)</td>
<td>10 May/Jun</td>
<td>42</td>
</tr>
<tr>
<td>d’ASSUMPCAO, Mr H. A.</td>
<td>13 Nov/Dec</td>
<td>16</td>
</tr>
<tr>
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<td>13 Nov/Dec</td>
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<td>FRANCIS, Major L. N.</td>
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<td>GRAEME-EVANS, Lieutenant A. L.</td>
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<td>13 Nov/Dec</td>
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<td>HOUSTON, Captain W. W.</td>
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<td>KITNEY, Mr Paul</td>
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