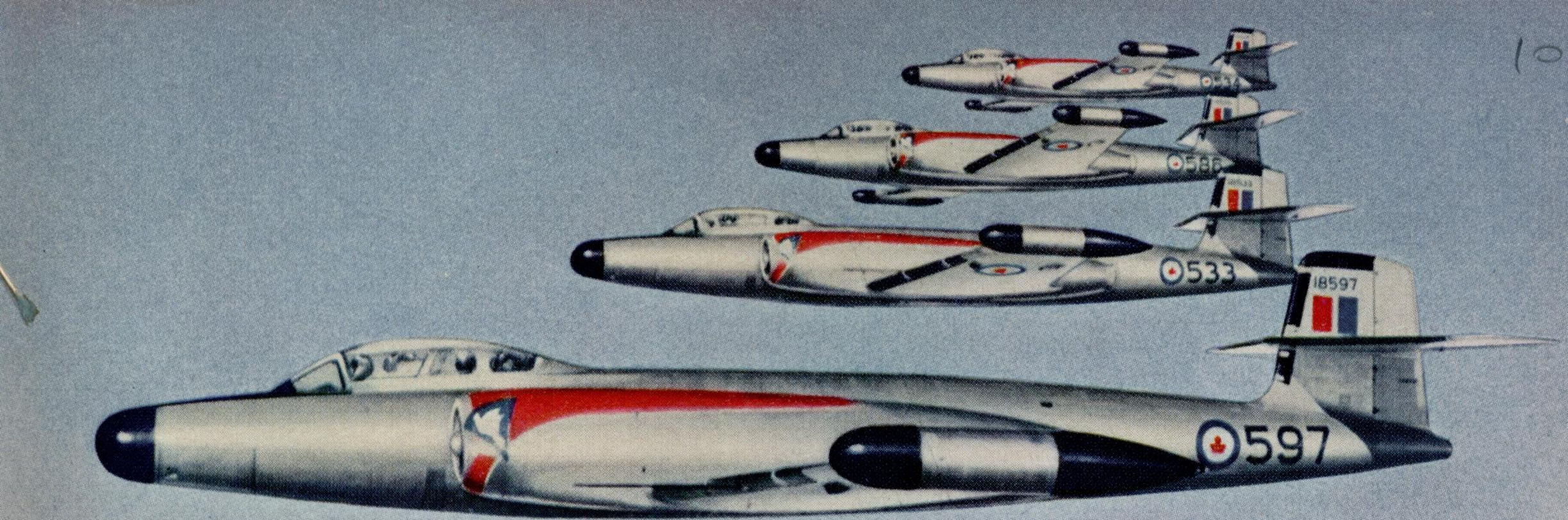
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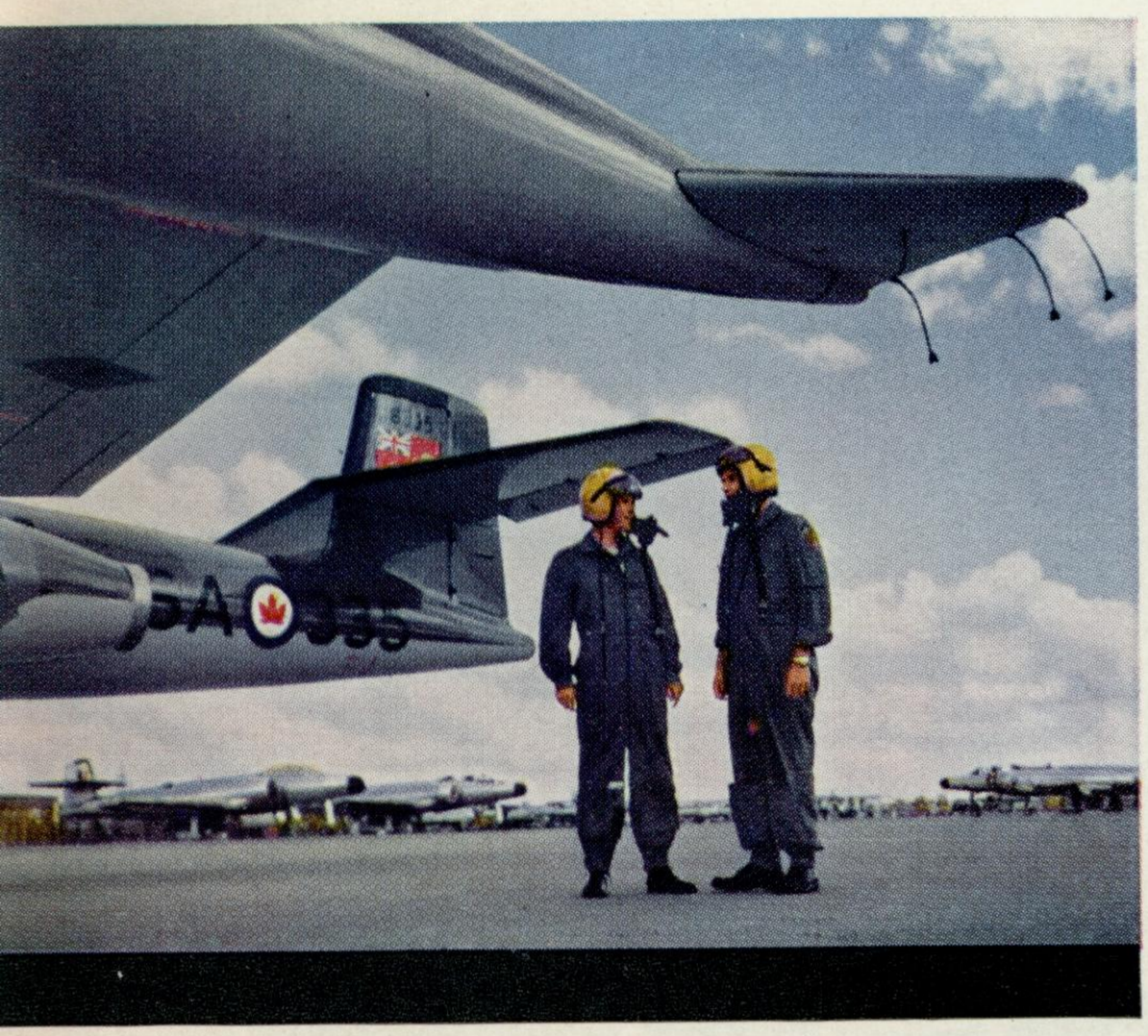
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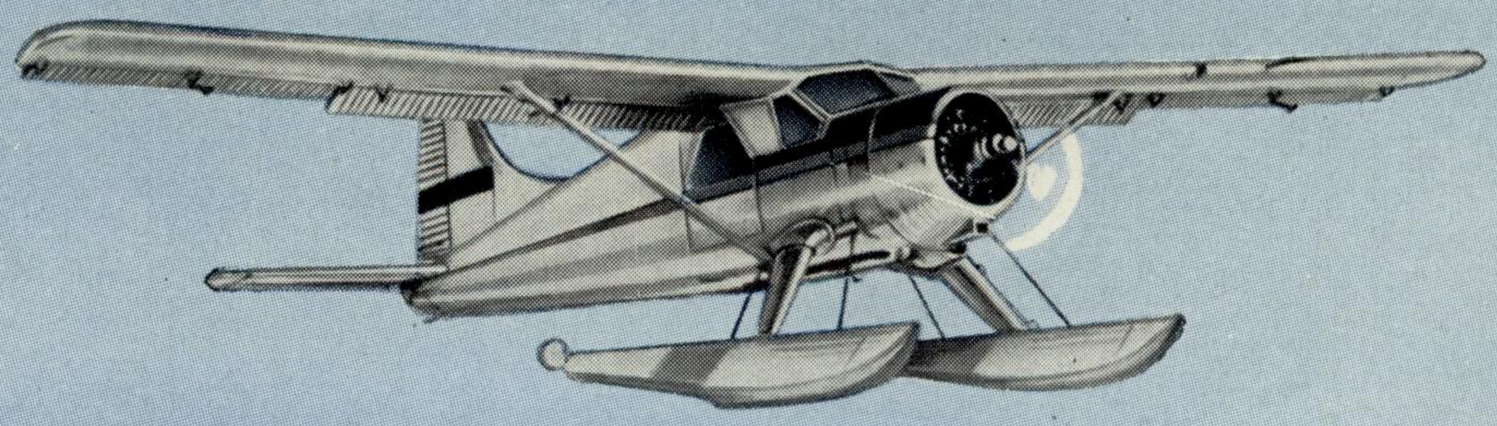
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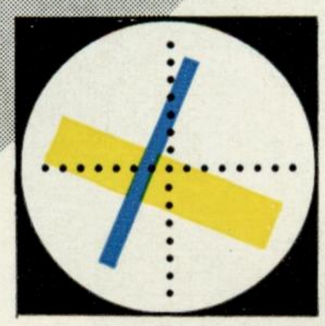


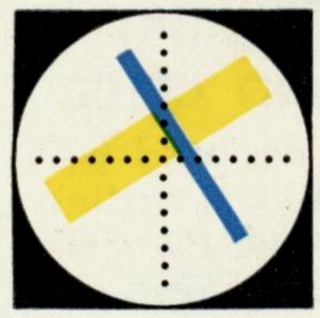
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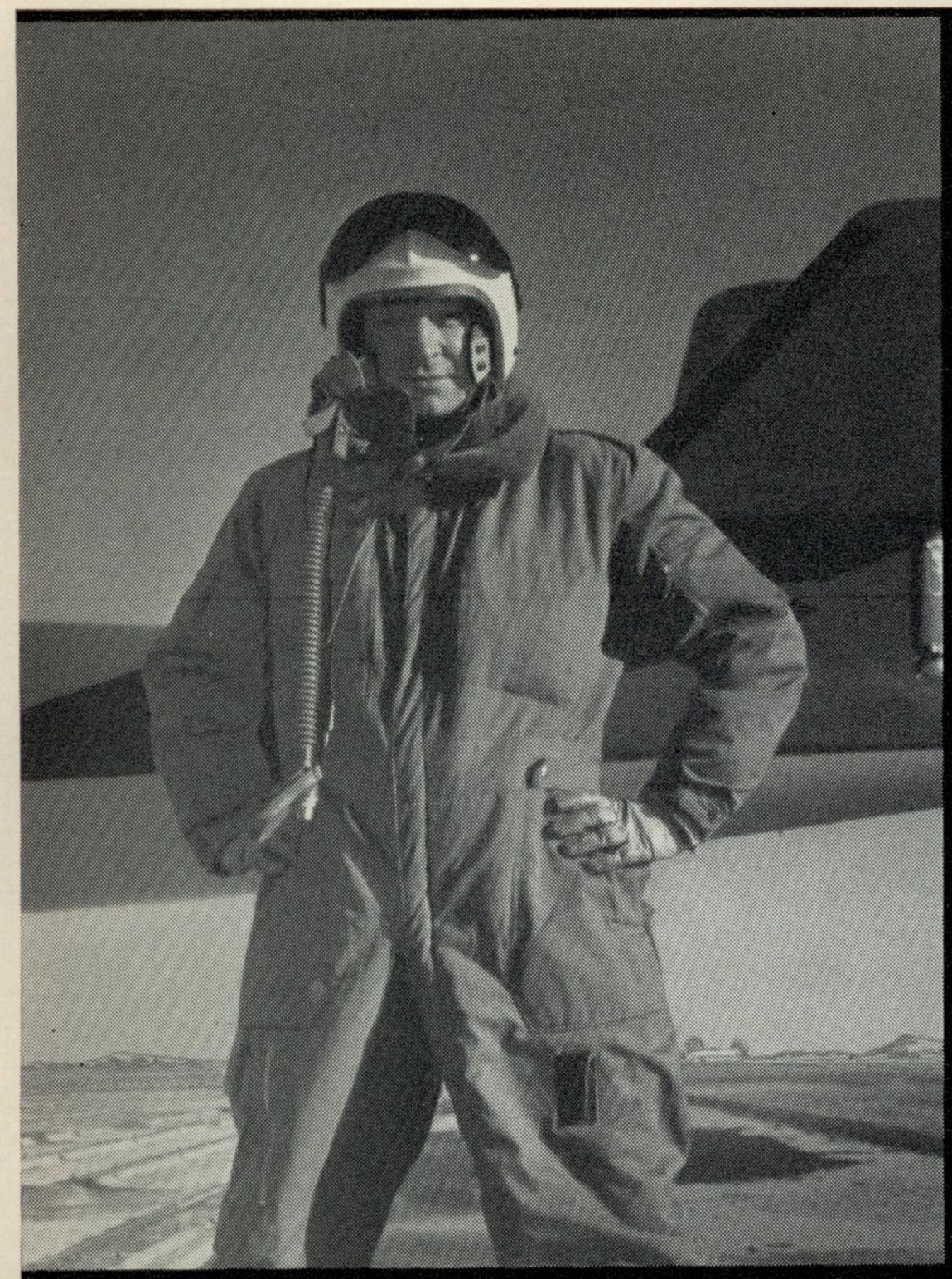
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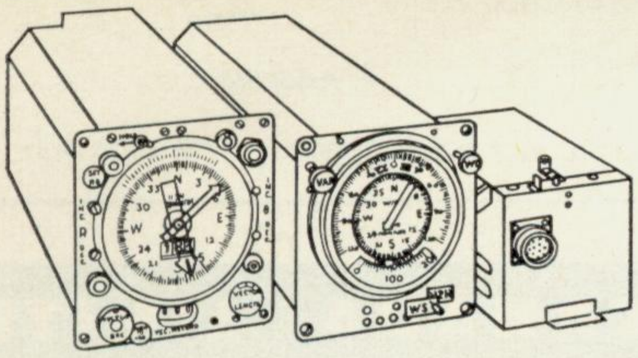
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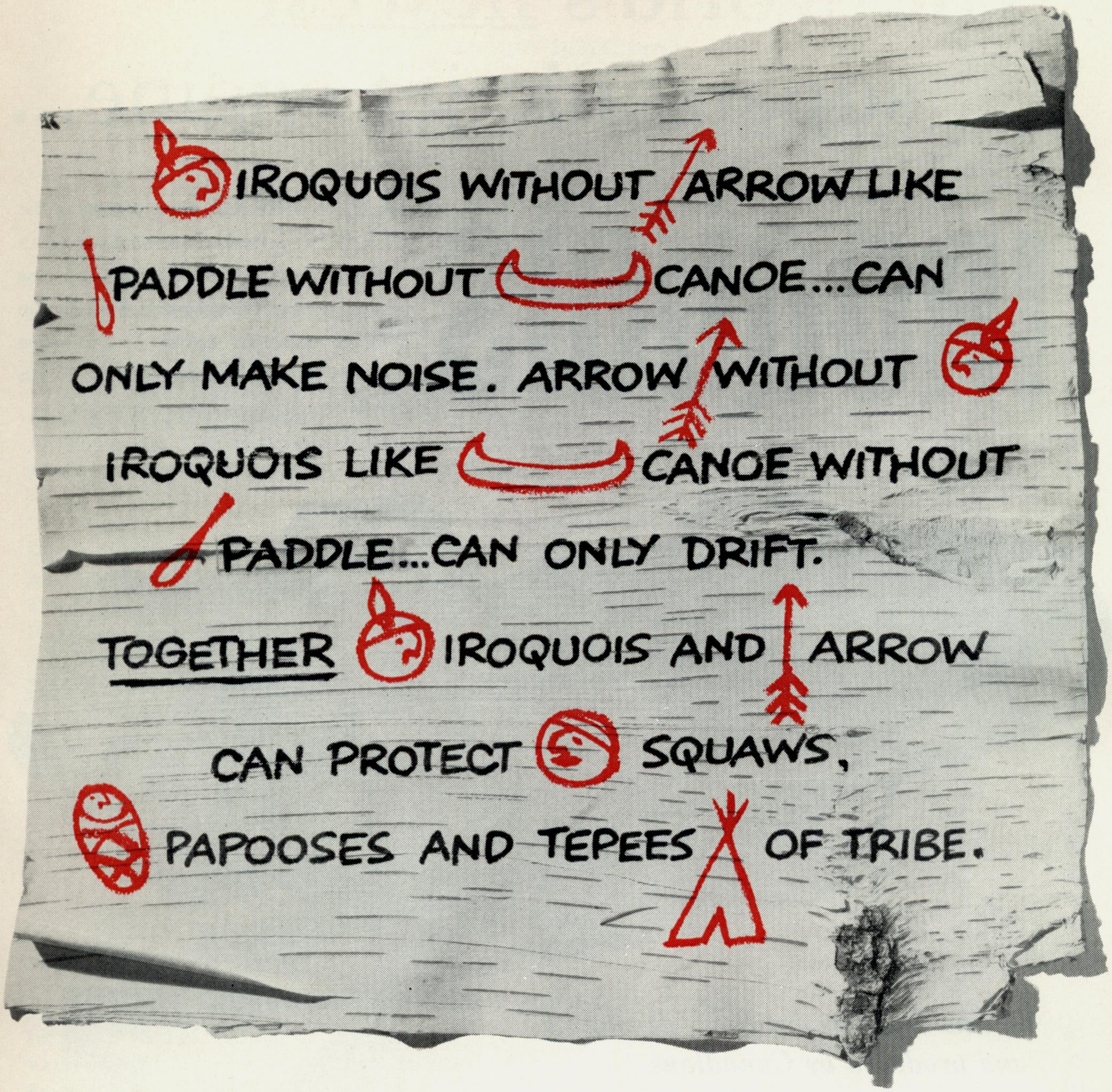
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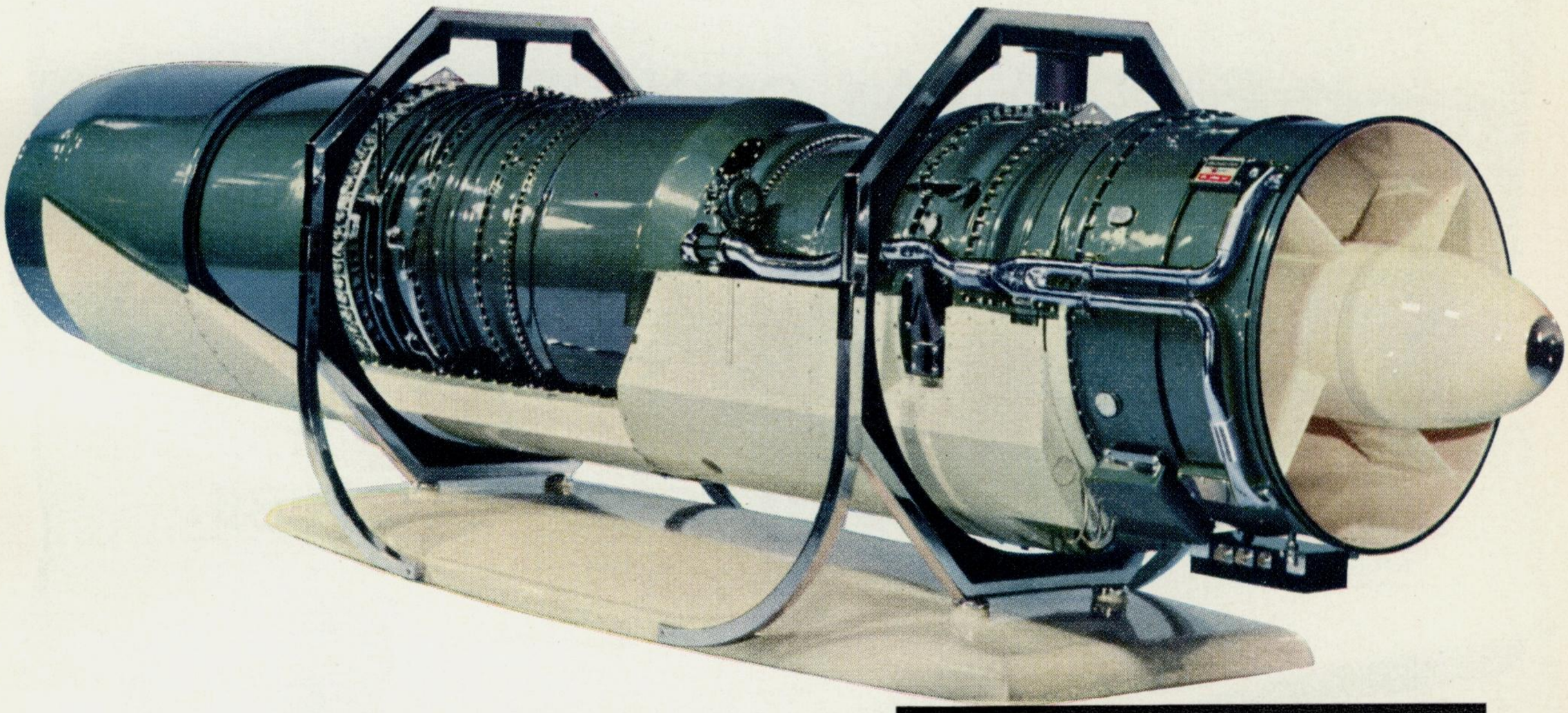
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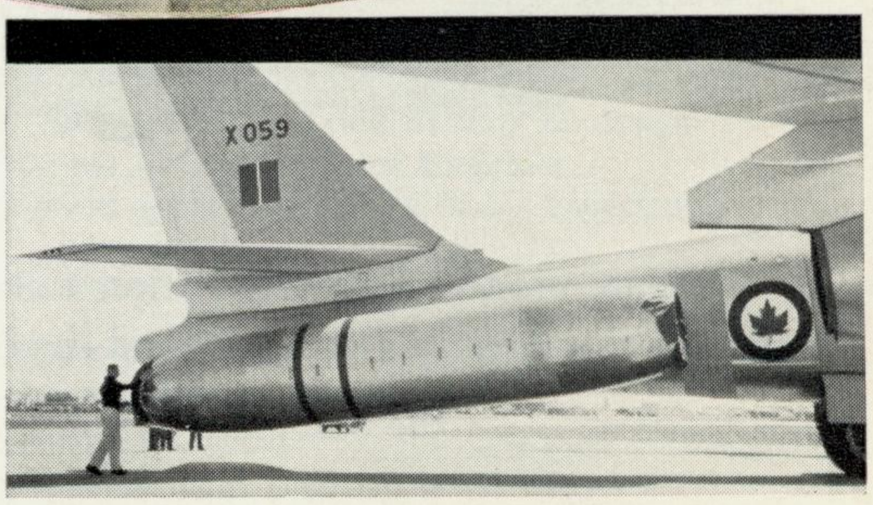
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CONTENTS

PART I – AIR POWER SYMPOSIUM — *Page*

Foreword by the Editor 11
Implications of Nuclear Weapons in Total War – *Bernard Brodie* 13
What's Our Line? – *J. Gellner* 23
Air Power and Future Wars – *J. I. Jackson* 29
Air Control in the Cold War – *Sir Robert Saundby* 36

PART II – FORUM

Scientific Aspects of Military Management – *C. M. Mooney* 45
Air Power, Sea Power, and Modern Weapons – *N. Emmott* 52
The Design of Active Air Defence Systems – *Richard H. Blythe, Jr.* 58
Professional Education for the R.C.A.F. – *J. I. Jackson* 63
A Concept of Management for the R.C.A.F. – *F. R. Sharp* 67
Book Reviews
The Soldier, The State, and Military Education 72
Global Strategy 76
American Defence and National Security 78
Air Power – The Decisive Force in Korea 79
Mission Completed 81
Radiation – What It Is and How It Affects You 82
The Organization Man 83
After Stalin, What? 84
NATO – The Economics of an Alliance 86
Ships in the Sky 87

PART III – COURSE 21's YEAR

Pictorial Review 93
Valedictory 98
Biographies – *Course 21* 99
Biographies – *Staff* 112
Reminiscing – The First Two Courses to Graduate 111
Advertisers' Index 114

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Part I – Air Power Symposium

FOREWORD BY THE EDITOR

THE ARTICLES which make up this symposium are not light reading; military art and science are subjects which approach theology in abstruseness, but which, like theology, are fertile fields for speculation by dilettantes. If some of the ideas developed here seem radical, or are not easily grasped, it is not because this Journal is consciously striving to be original at all costs, it is simply because military reality has moved away from the popular conception of it.

The fact of thermonuclear fission makes military strategy seem dreadfully simple, but modern strategy is not simple – as our contributors illustrate, for they do not agree on some fundamental issues.

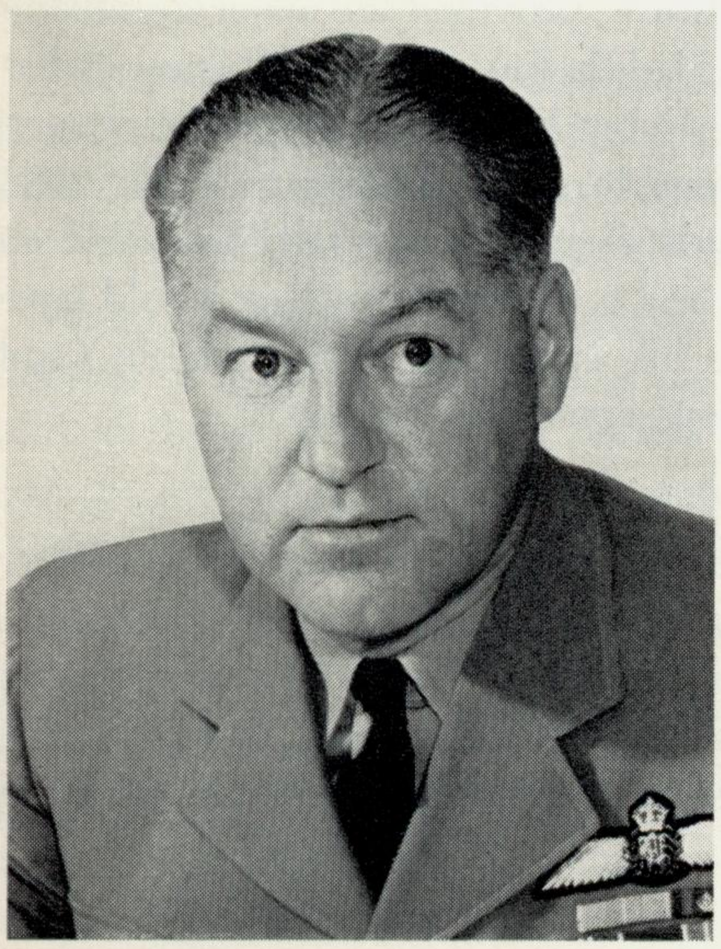
The first article, *Implications of Nuclear Weapons in Total War*, by Dr. Bernard Brodie, objectively traces the development of weapons from a previous era to the present day and precisely defines the contemporary military situation. Dr. Brodie, like many others, believes that wars of the traditional kind can no longer resolve anything and that the policy of massive retaliation has the most limited application, even though it is simple and easily understood.

That military theorists do not always produce simple theories may be due to a habit of hedging in order to avoid being hopelessly wrong, but by hedging they often miss the opportunity of producing the best solution to a problem, which may be the only correct solution. The military problems which face us today can only be solved by disciplined imagination, and Dr. Brodie exhorts us to be bold – and consistent.

A question which arises by implication out of the Brodie article is: What is the role of the armed forces today? Wing Commander John Gellner in attempting to answer this question with his article *What's Our Line?* arrives at a strategic concept which is almost the antithesis of that stated later in *Air Power and Future Wars* by his colleague at the Staff College, Professor J. I. Jackson. The key to this divergence of opinion lies in an assumption, denied by one and affirmed by the other, which has to do with a theory of sanctuary areas. The theory, which is outlined in H. A. Kissinger's important book *Nuclear Wars and Foreign Policy*, takes into account the major powers developing and maintaining the ability to retaliate with an overwhelming force of bombers armed with thermonuclear weapons. These bombers would be based in their homelands and behind air defence and, particularly, warning systems. Since to penetrate such systems would inevitably provoke retaliation and thus constitute national suicide, the areas contained by the air defence systems protecting retaliatory bomber fleets would be sanctuaries, and all war-like activity would necessarily take place outside the sanctuaries.

Wing Commander Gellner feels that an air defence system, particularly when it is faced with

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The first issue of the R.C.A.F. Staff College Journal was published in the autumn of 1956 – a venture of the Staff of the College. The aim of the Journal is to encourage professional writing on matters of serious military interest, particularly those pertaining to air power, and so to stimulate thought and discussion on those matters.

Although its publication is authorized by the Chief of the Air Staff, the Journal makes no attempt to reflect official Air Force policy. Contributors to its pages are therefore free to write their own views, the criteria for publication being that the quality of writing and the subject matter meet the requirements of the stated aim. The editorial board of the Journal decides in all cases what shall be printed.

In the 1957 issue the Journal presents a round table on some important general aspects of today's strategic situation. In addition, selected articles bearing on more specific military topics have been published and the essay judged to be the winner in the Journal-sponsored competition is included. These features together with some interesting book reviews make up Parts I and II of this year's publication. Part III concerns Class 21, which graduated in June, 1957.

It is hoped that our readers will find the 1957 Journal thought-provoking and stimulating.

W. A. ORR, *Air Commodore*

the intercontinental ballistic missile, can never be made positive enough to define, let alone protect, such sanctuary areas. If one agrees with him on this point one will have difficulty in denying the validity of the conclusions he reaches, which are that the atomic stalemate is real and permanent and that the West, while maintaining its "massive retaliation" capacity, should look to its means for making war with conventional weapons.

This view of the importance of maintaining a capability for massive retaliation may sound like an airman's cliché, but in Wing Commander Gellner's case it has its basis in another relatively new and not too well-known theory which may have fathered the sanctuary theory. This is Warren Amster's theory of deterrence. In essence, Amster holds that in the historical past a nation's economy has been about as easy to destroy as its armed forces. If a nation's armed forces were easier to destroy than its economy, and moreover could be attacked with good chances of success, a fearful enemy of that nation would always be tempted to make preventive war. On the other hand, if a nation's economy were relatively vulnerable to attack whereas its armed forces were not, and if the same situation prevailed in the camp of the enemy of that nation, providing each behaved rationally, neither would be tempted to attack the other because to do so would be to provoke sure retaliation. This is an over-simplification of the theory; Amster contends that the Deterrent State can be arrived at precisely through modern technology and the application of mathematics.

Evidently Wing Commander Gellner feels that this Deterrent State will only apply to atomic war, for although he is a Canadian and has been in the R.C.A.F. for over 18 years his viewpoint is oriented towards the European tradition, and he feels that wars in one form or another will always be resorted to as a solution to problems. He quite properly points out the danger of basing policies on an assumption of rational behaviour by the leaders of both parties to a contest in war. History shows the outlook of dictators to have often been morbidly influenced by the popular philosophies of the day. Rationalism is no longer in fashion, and putting aside communism for the moment, one can only speculate on the extent to which an existentialist dictator would be rational!

Because his assumption regarding the validity of the sanctuary idea is directly opposed to that of Wing Commander Gellner, J. I. Jackson arrives at entirely different conclusions. Professor Jackson feels that improvements in the technique of aircraft and missile detection are making sanctuary areas a reality. However, outside the sanctuary areas atomic weapons would inevitably be used in the event of war because the deployment which would have to be adopted by the surface components of forces under the threat of atomic attack would make the use of atomic weapons by that force, or in support of it, mandatory, even if the force were only charged with holding ground. Jackson sees future wars being both atomic and global, in the sense that they would embrace all areas of the world except certain well defined sanctuaries; and he believes that clashes between supply transports and far-ranging interdiction forces would become the most characteristic and decisive form of engagement between adversaries in such wars.

These two very different conceptions which have matured within the walls of the Staff College stem from the contemporary military situation as it is defined by Bernard Brodie.

The concluding article of the symposium, *Air Control in the Cold War*, by Air Marshal Sir Robert Saundby, deals with a subject which was much discussed during and after the Oman incident last summer but which is not nearly so well understood as it should be. Certainly a fog of subjectivity prevented any clear analysis of what Air Control entailed from being generally understood at that time.

None can write about the technique of Air Control with more authority than Sir Robert, for he was actively involved in its application for many pre-war years when the R.A.F. provided the major stabilizing influence in the Middle East. Sir Robert knows what Air Control can do but he also knows that it cannot, with the weapons it currently has to work with, solve all the kinds of problems it may be called on to solve today. And a change in outlook would have to occur before his hopes for more suitable (and humane) weapons could be realized.

Military thinkers who are knowledgeable in the field of air power carry a special responsibility which can only be discharged through their ideas being made public. The Journal is attempting to discharge its own responsibility in acting as the medium through which these ideas may reach their audience.

D. G. B-I.

Implications of Nuclear Weapons in Total War

BERNARD BRODIE

Dr. Bernard Brodie is a Senior Staff Member of the RAND Corporation, Santa Monica, California, which conducts scientific studies for the United States Air Force. His articles on strategy have been appearing in American periodicals since 1941; his important book "The Absolute Weapon" was published in 1946. Notwithstanding his official position, the views which Dr. Brodie expresses here are not necessarily those of the United States Air Force.

PEOPLE often speak of atomic explosives as the most potentious military invention "since gunpowder." But such a comparison inflates the importance of even so epoch-making an event as the introduction of gunpowder.

The people who lived through the first military use of gunpowder sometime in the early part of the fourteenth century seem to have been quite unexcited about it, and actually failed to record the occasion. Not until a century later, at the siege of Orleans in 1428-1429, do we find firearms, in this case seige guns, playing a major part in the battle, though still an indecisive one. In leading the final storming of that city, Joan of Arc was wounded by an arrow.

Gunpowder is often said to have established the superiority of the infantryman over the armored knight, and thus to have helped spell the death of feudalism. But the ascendancy of the infantryman, even without firearms, was in fact demonstrated effectively by English archers at Crecy (1346), Poitiers (1356), and Agincourt (1415), and during the same period by other peasants elsewhere in Europe.

A shrewder interpretation has held that it was not firearms but the reintroduction of discipline on the battlefield — lost since Roman times — that caused the demise of the armored, mounted knight.

When, in 1605 — three centuries after the introduction of firearms — Cervantes published the first part of the great novel that buried in mockery the Age of Chivalry, the flintlock had not yet been invented.[1] Field artillery was still to prove its worth; it did not become important until the Seven Years War, in the middle of the eighteenth century. As late as the American Revolution, so sensible a man as Benjamin Franklin was able seriously to consider the wisdom of arming the Continental soldiers with bows and arrows rather than with the cumbersome, slow-firing, unreliable, and grossly inaccurate muskets. Not until the middle of the nineteenth century — five centuries after the first military use of gunpowder — did we enter the age of modern firearms, with the perfecting of breech loading and rifling and, in artillery pieces, of explosive projectiles.

[1] However, the art of the armorer for man and horse had only recently come into its greatest glory. One especially magnificent specimen of a full suit of armor in the collection of the Metropolitan Museum of Art in New York City is dated 1590. Rather more intriguing is one, dated 1527, made for Galiot de Genouilhac who was *Master of Artillery* to Kings Louis XII and Francis I.

Evolution — Gunpowder and Other Weapons

When we speak of the revolution wrought by gunpowder, therefore, we are talking about something that required centuries to accomplish, and centuries of perspective to discern. Yet the gradualness of the development, with all the opportunities it permitted for doctrinal adjustment in the military arts, is still not the crux of the matter. The gun and its relatives remained from first to last strictly *tactical* weapons, gradually displacing weapons such as the battering ram, the arrow, the sword, and the lance, but only by proving superior in exactly the same functions that those weapons had exercised on the battlefield.

At least until World War I, which for the first time produced the phenomenon of nationwide continuous lines that could not be outflanked, the study of military strategy, and frequently even of the grand tactics of battles, both on land and at sea, could proceed profitably from the study of campaigns going back to antiquity. The thesis that "methods change but principles are unchanging" had much to justify it, because methods did not change very much, or at any rate not too abruptly. The application of lessons of the past to current and predicted military problems always required a

proper appreciation of changed technological conditions, but to the more reflective and objective students of war such adaptation offered no great difficulty, at least until the advent of nuclear weapons.

Even before the atomic bomb the aeroplane threatened to take war away from the battlefield, and Douhet and his followers proclaimed that it had done so. But because of the limitations of the high-explosive and incendiary weapons fired and dropped from aircraft in two world wars, it took time to achieve decisive results. During that time aircraft had to fight for command of the air, and land and naval campaigns unfolded in their old accustomed fashion, profoundly affected by the new arm as they had always been by each other, but nevertheless retaining their essential and distinctive characteristics.

Instead of taking war away from the battlefield, in other words, the aeroplane only added a new area of battle behind the fronts, and a third dimension to those already prevailing on land and at sea. The science of strategy, which had always been divisible into two parts, was now divisible into three. For the two traditional forms of war, the basic treatises had been written and needed only to be modified. Air strategy still awaited its Mahan — for Douhet's philosophy, however farsighted, had proved critically deficient — but the early appearance of the new air philosopher could be confidently expected. The air experience of World War II was sufficient in bulk and variety to provide him with the necessary materials. But instead the atomic bomb came and changed everything.

The Atomic Revolution

Few people were unexcited or unimpressed by atomic weapons. That something tremendously important had happened was immediately understood by almost everyone. Interpretations of the military significance of the new weapons naturally varied, but even the most conservative saw nothing inappropriate or extravagant in such extraordinary consultations and decisions as resulted in the Truman-Attlee-King Declaration of November 15, 1945, or the Baruch Proposals before the United Nations in the following year. Then the MacMahon Act set up the Atomic Energy Commission, a separate and markedly independent government agency hedged about by all sorts of special provisions, for the manufacture and development of atomic weapons. Nothing of the sort had ever happened before; but photographs of the destruction wrought at Hiroshima and Nagasaki had been spread across the land, and few persons were unaffected by the thought that the damage had in each case been done by a single aircraft.

This was the response evoked by the explosion of two atomic bombs over Japan (plus the simultaneously released news of the test shot at Alamagordo) at a time when few if any more were known to exist. In retrospect it is apparent too that the more conservative of the opinions then expressed on the implications of atomic weapons were in the main wedded to presumptions that were soon to be disproved; for example, that the bomb was fated to remain scarce, extremely costly, bulky and therefore difficult to deliver, and limited to about the same power and spatial effectiveness as the Nagasaki bomb.

In an age that had grown accustomed to rapid advances in military technology, how remarkable was this immediate and almost universal consensus that the atomic bomb was different and epochal! Equally striking was the fact that the invention caused the greatest forebodings in the hearts of the people who first possessed it and benefited from it. The thought that it represented a fabulous and mostly American scientific and engineering accomplishment, that it had apparently helped to end World War II, and that the United States had for the time being a monopoly on it seemed to cause no exhilaration among Americans.

Subsequent events neither undermined the early consensus on the importance of the new weapon nor qualified the misgivings. On the contrary, the first decade of the atomic age saw the collapse of the American monopoly, of the myth of inevitable scarcity, and of reasonable hopes for international atomic disarmament. It saw also the development of the thermonuclear weapon in both major camps. If at the end of that decade one looked back at the opinions expressed so voluminously at the beginning of it, one found almost none that had proved too extravagant. Only the conservative guesses had proved to be the hopelessly wrong ones.

It is no longer possible to distinguish between the new weapons on the one hand and the "battle-tested" or "tried and true" ones on the other, because in this new world no weapons are tried and tested. The hand rifle, the field gun, and the tank, as well as the infantry division or combat team that uses them, are at least as much on trial in the age of atomic warfare as is the atomic bomb itself; indeed, they are much more so.

The Thermonuclear Age

Since we are now well launched in the thermonuclear age, we might first ask what differences, if any, the thermonuclear or hydrogen bomb must make for our strategic predictions. We have been living with the fission bomb for more than a decade, and it may well be that the fusion type introduces nothing essentially new other than a greater economy of destruction along patterns already established. Unfortunately that is not the case.

No doubt the strategic implications of the first atomic bombs were radical in the extreme, and it was right at the time to stress the drastic nature of the change. The utility of strategic bombing as a way of war could no longer be questioned. It at once became, incontrovertibly, the dominant form of war. A strategic-bombing program could be carried through entirely with air forces existing at the outset of a war, and at a speed which, however variously estimated, would be phenomenal by any previous standard. Also, it could be carried out successfully over any distance that might separate the powers involved. These conclusions represented change enough from the conditions of World War II.

Nevertheless, fission bombs were sufficiently limited in power to make it appear necessary to deliver a substantial number of them to achieve decisive and certain results. That in turn made it possible to visualize a meaningful (though hardly satisfactory) air defense, both active and passive. It was therefore still necessary to think in terms of a real struggle for command of the air in the old Douhet sense. It was also still necessary to apply, though in much modified form, the lore so painfully acquired in World War II concerning target selection for a strategic-bombing campaign. Finally, the functions of ground and naval forces, though clearly and markedly affected by the new weapons, still appeared vital.

Even these tenuous ties with the past were threatened when it became known that thermonuclear bombs were not only feasible but apparently also inexpensive enough to justify manufacture in very substantial numbers. Possibly the feeling that the H-bomb was distinctively new and significantly different from the A-bomb argued in part an underestimation of the A-bomb. But when one has to confront a basic change in circumstances, it helps if it is unequivocal.

The "Mike" shot of the Operation IVY series, set off on November 7, 1952, caused the complete disappearance of the small island of Elugelab on which the thermonuclear device was placed. In its place was left an underwater crater over one mile across and about 175 feet deep at the center, or, as was later publicly stated, large enough to hold fourteen buildings the size of the Pentagon. It was announced that the amount of energy released was over five million tons (or five "megatons") of TNT equivalent, and the fire-ball itself was about three and one-half miles across (as compared to about one-sixth of a mile for a "nominal" 20 K.T. bomb).

At the time this information was released, almost a year-and-a-half after the event, at least one other American thermonuclear explosion had taken place (the "Bravo" shot in the CASTLE series on March 1, 1954), and it was reported to be several times more powerful than "Mike." Small wonder that the AEC Chairman, Rear Admiral Lewis L. Strauss, stated on that occasion that the H-bombs the United States could build and deliver would be individually capable of wiping out any city in the world! Subsequently the world learned that the March 1954 shot had also produced an unexpectedly large amount of radioactive debris, which was deposited as "fallout" of dangerous and even lethal intensity over thousands of square miles and up to distances of 200 miles or more downwind from the explosion.

Target Selection in Thermonuclear War

It became apparent that certain controversial military questions that had remained pertinent in the fission-bomb era were no longer worth tarrying over. Chief among these were the questions inherited from World War II concerning the appropriate selection of industrial target-systems. Industrial concentrations are usually associated with cities and vice versa, and since a thermonuclear bomb exploded near the center of a city would as a rule effectively eliminate the industrial activities associated with that city, there is hardly much point in asking which industries should be hit and in what order, or which particular facilities within any industry.

Once the question *whether* to attack the enemy's economy or "mobilization base" is answered affirmatively, that is, once we are embarked upon an unrestricted nuclear war, the question of what to hit is all too simple to answer. We simply select the enemy's cities, which constitute the easiest targets to find anyway. Of course the enemy's strategic air force must be the top-priority target in terms of time, and possibly also in weight of bombs, but destroying the enemy's air force (if it can be done) is essentially a defensive move, and as such demands some kind of sequential action.

Perhaps there is nothing in logic to make such a sequence inevitable, but it is very likely to be considered a practical necessity. The attacker could rarely count with high confidence on fully eliminating the enemy air-force, even if he struck first. He would, therefore, probably feel obliged to begin the counter-economy competition before he knew the results of the counter-air force strike. In any case, decisions of the sort we are implying would have to be made well before hostilities began, which is to say only that emergency war plans intended to cover the opening phases of possible future hostilities are, and should be, prepared in peacetime and periodically revised. As a matter of practical strategic planning, one would naturally expect that even where a counter-air force attack was given top priority in the relevant war plan, a counter-economy attack would to some degree be integrated with it.

In fact, since many major enemy airfields are bound to be near cities, the distinction in priority is in such instances likely to be an academic one. It is idle to talk about strategies being counter-force strategies, as distinct from counter-economy or counter-population strategies, unless we actually find ourselves taking deliberate measures to refrain from injuring cities. It can hardly matter much to the populations involved whether the destruction of cities is a by-product of the destruction of air fields or vice versa.

No doubt there would be a significant difference in ultimate results between a strategy that was aimed primarily at the enemy air force and one aimed chiefly at population, even if a lot of people were killed in both. However, it must be remembered that in striking at an enemy strategic air force, an attacker will normally be obliged to hit a great many more airfields than those indicated to be major strategic air bases; because he must assume in advance that a good deal of dispersion of enemy aircraft will have taken place as a result either of warning or of routine operating procedures. And in striking at airfields near cities, he might choose to use some quite large thermonuclear weapons, especially if he tended to regard as a "bonus" any damage achieved in addition to that primarily sought after.

Cities as Thermonuclear Targets

The number of cities that account for the so-called economic war potential of either the U.S. or the U.S.S.R. is small: possibly fifty or less, and certainly not over 200. The range in these figures is the result of the varying weight that can be given to certain tangible but difficult-to-measure factors, such as that of interdependence. The leading 54 American "metropolitan areas" (as defined by the Census Bureau) contain over 60 per cent of the nation's industrial capital, and a population of 65,000,000, including a disproportionate number of the people whose special skills are associated with large-scale production. The Census Bureau lists altogether 170 metropolitan areas in the United States, which contain over 75 per cent of industrial capital and 55 per cent of the nation's population. We must note that by far the greater portion of these cities are concentrated in the eastern and especially the northeastern part of the United States, where most of the non-urban population is also gathered, and where urban and non-urban populations alike may be subject to overlapping patterns of radioactive fallout. The concentration of industry in Russian cities, and the concentration of cities and populations in the western part of their national area, make of the Soviet Union a target area roughly comparable to the United States.

The great Hamburg raids of July 1943, which were so tremendous a shock to the whole German nation, caused the destruction of about 50 per cent of the city's housing and resulted in casualties amounting to about three per cent of the population. A single H-bomb of anything above one megaton yield bursting within the confines of a city such as Hamburg would cause a degree of housing destruction much higher than 50 per cent; and unless the city had been evacuated in advance the proportion of casualties to housing destroyed would certainly be far greater than it was at Hamburg.

The latter fact underlines one of the distinctive features of nuclear weapons. There are at least four reasons why casualty rates with nuclear weapons are likely to be far greater in relation to property destroyed than was true of nonatomic bombing: (1) warning time is likely to be less (or nonexistent) unless the attacker deliberately offers it before attacking; (2) the *duration* of an attack at any one place will be literally a single instant, in contrast to the several hours' duration of a World War II kind of attack; (3) shelters capable of furnishing good protection against high-explosive bombs might be of no use at all within the fireball radius of a large ground-burst nuclear weapon, or within the oxygen-consuming fire-storm that such a detonation would cause; and (4) nuclear weapons have the distinctive effect of producing radioactivity, which can be lingering as well as instantaneous, and which causes casualties rather than property injury.



No doubt there are a few very large metropolitan areas in the United States and in other countries which are wide enough in area to be able to escape complete destruction by a single thermonuclear weapon. But even two or three bombs for each such area is still a small number. And so far as concerns choosing the size of bombs for smaller cities, we must remember that the difference in cost between a thermonuclear bomb of, say, ten megatons yield and a fission bomb of 200 kilotons yield will usually not be great enough to be the critical factor in determining the choice between them for distant targets. The cost difference will almost certainly be small relative to the entire cost of the sortie.[2] There may be a significant weight difference between the two bombs, but for aircraft large enough to possess the ranges needed in strategic bombing, even that difference may not be important. What all this means is that "overkilling" will be cheap and therefore, according to the military considerations normally brought to bear, no longer to be shunned.

[2] We are here using the cost index as a gauge of availability, and doing so presupposes some reasonably intelligent planning decisions in the past. Naturally, once the shooting begins the dollar cost of a weapon in the stockpile is in itself an absolutely irrelevant historical datum in determining the use of that weapon.

Moreover, an amount of force-yield that would be grossly excessive for any accurately-aimed bomb would make possible methods of delivery – such as the long-range ballistic missile – much less accurate, though superior in other ways, to those currently available. In these, however, the weight of the bomb or warhead is likely to be a much more critical factor than in aircraft, at least in the earlier phases of missile development.

No doubt the problem of getting nuclear weapons delivered to 50, 100, or 200 widely spaced points does not look as simple to those who have to plan the operation as it does to laymen. And since enemy strategic airfields must as a rule also be hit, the total number of targets is multiplied, perhaps by several times, over the figures just suggested. But, to repeat, the bombing of enemy strategic airfields or missile-launching sites is a strictly defensive mission, and the existence of such a requirement (which is by no means inevitable or absolute under all conceivable circumstances) should not be permitted to obscure the fact that with the new nuclear weapons the number of individual targets that have to be struck in order to put any nation out of business as a producing or even functioning organism is extremely small. It is ridiculously small when measured against the standards of a period as recent as World War II. This is obviously the central fact to consider when appraising the apparently still-disputed "decisiveness" of strategic bombing with nuclear weapons.

The Concept of "Broken-backed War"

The British in their 1954 *Defence White Paper* used the expressive phrase "broken-backed war" to describe what presumably would happen after the first huge exchange of thermonuclear weapons, assuming the exchange itself failed to be decisive.[3] Various Americans have adhered to the same conception without necessarily using the phrase. The essential feature of the idea is the insistence, usually implicit, that war resources, human and mechanical, will continue to be drawn from the national "mobilization base" and that the margin of advantage that one side or the other enjoys in this respect

[3] "In this event (global war), it seems likely that such a war would begin with a period of intense atomic attacks lasting a relatively short time but inflicting great destruction and damage. If no decisive result were reached in this opening phase, hostilities would decline in intensity, though perhaps less so at sea than elsewhere, and a period of broken-backed warfare would follow, during which the opposing sides would seek to recover their strength, carrying on the struggle in the meantime as best they might." *Statement on Defence,* 1954, Presented by the Minister of Defence to Parliament . . . February 1954 (London: Her Majesty's Stationery Office, Command Paper No. 9075), p.5.

is what will prove decisive in the end.[4] Although the conception of "broken-backed war" appeared to be entirely abandoned in the *Defence White Paper* for 1955, which tended instead to rest everything on "deterrence", it has nevertheless continued to underlie and to confuse the basic structure of American and Allied defense planning.

One can easily conceive of conditions in both contending camps so chaotic, following the opening reciprocal onslaughts, that the war issue will not be immediately resolved and hostilities not formally concluded. One can also picture surviving military units, including some possessing thermonuclear weapons and means of delivering them, continuing to hurl blows at the enemy to the utmost of their remaining though fast-ebbing capacity. But it is difficult to imagine such intensive continuing support from the home front as would enable "conventional" military operations to be conducted on a large scale and over a long enough time to effect any such large and positive purpose as "imposing the national will on the enemy", or, to use the words of former Chief of Staff, General Matthew B. Ridgway, "Carrying the fight to the enemy and defeating him."[5]

The major premise of the "broken-backed war" conception was that the result of the initial mutual nuclear violence would be something like a draw. Otherwise it could not fail to be decisive. The second premise (we cannot call it a minor one) was that the level of damage on both sides following the strategic nuclear bombing phase would be limited enough to permit each to equip and sustain air, ground, and naval forces of sufficient dimensions to be able to execute noteworthy military operations. These would, presumably, be conducted at some distance from home, and would therefore require facilities, such as ports and associated railway terminals, which are generally found only in those larger coastal cities which would certainly be among the first targets hit in the nuclear phase. Implicit also was the further dubious assumption that somehow the nuclear phase would end cleanly, or diminish to a trivial magnitude, early in the hostilities, and at about the same time for both sides.

Another and perhaps more practical reason for questioning the "broken-backed war" conception is that no one seems to know how to plan for such a war. There are special psychological reasons why official war planners have always in times past found it almost impossibly difficult to predicate a war plan on the assumption of national disaster at the outset. But in this case, even if the spirit were willing, the data and the imagination would be much too weak.

The Problem of Survival

There are, of course, numerous examples in recent history of magnificent improvisation following upon disaster, or rather upon what used to be called disaster. But in each of those cases the means of making war, including such vital intangibles as established governmental authority operating through accustomed channels of communication, remained intact. A few battleships sunk, a few armies defeated and lost, even large territories yielded, do not spell the kind of over-all disaster we have to think about for the future. There are limits to the burden that can be placed on improvisation. The improvisation which the survivors of thermonuclear attack may find it within their capacities to come up with will surely have to be largely occupied with restoring the bare means of life.

No one who has studied the German military, economic, and even social performance under strategic bombing can fail to be impressed by it. But the German capacity to absorb the blows and to take compensatory measures for the damage received depended, among other things, on their having both the time and the incentive to organize those measures. When the main weight of our strategic bombing descended upon them in the spring of 1944, they had had at least three years of serious attacks, including the terrible warning of the Hamburg raids of July 1943. Even so, the campaign waxed only gradually to its climax, and never, even when the British-American strategic bombing forces were at the height of their power, were they able to inflict in six months of bombing the scale of

[4] "Presumably massive blows would continue as long as either side retained the capability . . . With the passing of that initial phase, and if the issue is still unresolved, tough people would carry on across the radioactive ashes and water, with what weapons are left. Sea control will be an elemental consideration in accomplishing either the follow-through phase of atomic war or the better appreciated chores of a prolonged non-atomic war." Admiral Robert B. Carney, then U.S. Chief of Naval Operations, in a Cincinnati speech of February 21, 1955, as reported in the *Washington Post and Times Herald* for the following day.

[5] In his speech before the National Press Club in Washington, D.C., March 19, 1954. This speech was reproduced in full in the Congressional Record — Appendix; March 24, 1954, pp. A2254-6 (under "Extension of Remarks of Hon. Dewey Short). It is noteworthy that at that time General Ridgway still found himself able to conceive of a future war in which we would "reduce the other side's industrial potential and military bases" but would nevertheless succeed in carrying out on our own side "not merely the mobilization and training of men but also the conversion of industry to full war production." In other words, General Ridgway was imagining not so much a "broken-backed" war as a war marked by an essentially one-way strategic air attack. One might well question, under such premises, the necessity for a full mobilization of the national resources!

destruction that would lie easily within the capability of the U.S. Air Force on Day 1 of a new war. The differences in circumstance that accounted on the one hand for the French resistance in 1914 and, on the other, for the collapse in 1940 were of trivial magnitude compared with the differences between pre-atomic and present-day strategic bombing.

No one, of course, can specify how many nuclear bombs it would take to "knock out" (assuming we know what we mean by that term) a country as large as the Soviet Union or the United States, and analytical studies of what happens under attack can do little more than suggest upper limits to the broad range of figures that might be considered reasonable. Such studies almost inevitably work with individual targets rather than with a whole national complex. They must depend on what are little more than educated guesses for various critical planning factors, including even those pertaining to the physical effects of bomb explosions. They must work with quite wide ranges of assumptions concerning such things as the size and the positioning of bombs delivered, the length of warning time, etc. Such studies cannot even touch the imponderables, such as popular panic and administrative disorganization, which might easily govern the end result. Those who do such work are as a rule interested in the results from the offensive or targeting point of view, and they therefore deliberately try to be conservative in the estimates they make. One of the ways to be conservative is to dismiss consideration of all imponderables as unmeasurable.

At the other end of the scale, methodologically speaking, is a judgment such as the following one by Marshal of the Royal Air Force Sir John Slessor:

> "I have the perhaps somewhat unenviable advantage of an experience, which fortunately has been denied to most people, of being in a city which was literally wiped out, with most of its inhabitants, in fifty-five seconds by the great earthquake in Baluchistan in 1935, a far more effective blitz than anything laid on by either side in the late war, except Hiroshima and Nagasaki. When people talk light-heartedly about that sort of thing on a widespread scale not being decisive, I have to tell them with respect that they do not know what they are talking about. No country could survive a month of Quetta earthquakes on all its main centres of population and remain capable of organized resistance.[6]"

[6] Sir John Slessor, *Strategy for the West* (New York: William Morrow, 1954), p. 111.

And Slessor is describing a catastrophe that is free of the additional terrible menace of lingering radioactivity.

It must be repeated that Sir John's intuitive conviction, which in fact accords with the average layman's judgment, reflects at least one tacit assumption concerning defenses. In general, the assumption is that the prospects for the radical improvement of both active and passive defenses against nuclear weapons are not bright.



Defense and the Thermonuclear Weapon

First we must recall the fantastic degree to which the coming of the A-bomb itself gave a lead to the offense over the defense; subsequent developments in nuclear weapons have tended to further that advantage. A proposed system of defense which looked interesting one year against fission bombs looked altogether useless and wasteful the next, when thermonuclear weapons also had to be taken into account. This movement favoring the offense has by no means run its course so far even as manned aircraft are concerned, but we are told also that the advent of the operational long-range ballistic missile with nuclear warhead is only a matter of time. And there seem to be very few ideas afloat about how to erect effective active defenses against that.

So far as concerns passive defenses, such as dispersion or "hardening", the problem is to discover and adopt measures that are not easily neutralized simply by some modest increase in the quantities or yields of the bombs delivered by the enemy. The growth of national nuclear stockpiles is practically irrepressible, and while delivery capabilities do not normally expand with the same exuberance, it is nevertheless likely to be far easier and much less costly for one side to double the number of bombs-on-target than for the other to double by dispersion, the number of targets that the enemy must hit.

On the other hand, the hardening of targets by putting shelters around them may be very expensive, but it would at the same time be effective over a wide range of bombs-delivered figures. Human casualty rates may also be very much reduced by resort to deep shelters, provided there is sufficient warning time, and provided also that there has been sufficient preparation beforehand to sustain life during and after immurement in those shelters.

Let us, however, finally note the fact that there are enormous impediments—psychological, political, economic, and above all doctrinal — to the adoption of sufficiently drastic measures for defense. The proof of that lies in all we have conspicuously failed to do after twelve years of living with the atomic bomb. New and effective stimuli to action may yet turn up, but some exceedingly powerful ones have failed to move us.

As for the offensive-defensive, the so-called blunting mission of the U.S. Strategic Air Force, its success must depend not only on a national initiative which is largely out of military hands, but also on surprise (which is impossible without initiative, yet not guaranteed by it), on intelligence, on the character of enemy base-utilization patterns, and on the various measures he may adopt for the protection of his long-range air force.

From all this one would seem justified in drawing the following conclusion: barring revolutionary and presently unforeseen advances in air defense, an unrestricted strategic air campaign in a war in which the United States is engaged is bound to be decisive. It does not matter greatly whether the number of nuclear weapons-on-target required to guarantee decisiveness is a few score or a few hundred, because we are, even in the latter case, in realms of figures that are well within the capabilities at least of the United States (the critical factor being, of course, delivery capability rather than size of the nuclear stockpile). And it is equally certain that these figures are now or soon will be within the capabilities of one or more other powers.

Possibly our basic conclusion would be in jeopardy if the figures for required bombs-on-target went into several thousands, which would bring into question the adequacy of existing delivery systems. But since we are talking about a mix of nuclear weapons that includes a fair proportion of thermonuclear bombs, figures for a strategic-bombing campaign running into the thousands of bombs-on-target are likely to be either morbidly fanciful or pointed toward a campaign aimed not merely at a simple military decision but at complete national obliteration.

Surface Operations in Thermonuclear War

On the other hand, when we say that strategic bombing will be decisive, we are not using that term in its traditional sense, that is, in the sense that something is achieved which predetermines a clear victory for one side or the other. We mean instead that if strategic bombing occurs on the grand scale that existing and certainly future forces make possible, other kinds of military operations are likely to prove either unfeasible or superfluous or, most likely, both. The Red Army, if poised to spring, could perhaps have a certain brief career as a disembodied force even if its homeland were laid entirely waste behind it, though in such a case it would itself also be the target of nuclear weapons of all sizes; and such an independent career would be possible only for the Red Army, since it has the advantage, denied to the ground forces of Britain and the United States, of having its main potential spheres of operation in areas contiguous to its homeland.

The point just made cannot be proved except negatively, that is, by throwing the burden of proof on those who would show us how modern armies and navies can operate effectively, and to a useful purpose, when their home territories, and certainly the larger towns thereof (including all naval bases and ports) are masses of rubble and radioactive dust. Discussions in professional military journals of the operations of armies and navies (and even air forces) in a major war of the future almost always tacitly assume an intact home front, or at least one where the damage is so minimal as to be irrelevant to offensive plans.

We should not discount the importance of the fact that for countries as large as the United States or the Soviet Union, the number of human beings and the amount of equipment that may escape destruc-

tion even after heavy thermonuclear attack could, in absolute terms, be quite large. Much that is valuable (e.g., our highway network) is hardly even exposed to risk. Besides, we must remember always how much we do not know about this entire subject, and how many different contingencies have to be accounted for.

Nevertheless, from a sober appreciation of the possibilities in this field of dismal speculation, it seems quite safe to assume that the number of people and the kind and quantity of capital that may survive strategic attack will be important far more for determining the character and degree of national recovery *following* the hostilities than for controlling the subsequent course of the hostilities themselves. The *minimum* destruction and disorganization that one can reasonably expect from any unrestricted thermonuclear attack in the future must almost inevitably be too high to permit further meaningful mobilization of war-making capabilities, certainly over the short term, and may well prevent effective use of most of any surviving military units already in being.

It should also be recognized once and for all that so far as predicting human casualties is concerned. we are talking about a catastrophe for which it is essentially impossible to set upper limits appreciably short of the entire population of a state. It is not only those in cities and in towns who will be exposed to risk, but, in view of the fallout effect, practically all. And it is simply not true that the fallout effect, where the attacker is determined to exploit it, is something that is easily met and contained. What we are in effect saying is that although the uninjured survivors of attack may indeed be many, it is also all too easily conceivable that they may be relatively few. The latter contingency is the more likely one in the absence of large-scale protective measures such as neither we nor any other people have yet shown ourselves prepared to mount. But whether the survivors be many or few, in the midst of a land scarred and ruined beyond all present comprehension, they should not be expected to show much concern for the further pursuit of political-military objectives.

Ambiguity in Policies

The reader who was prepared to accept as obvious at the outset the conclusion we have labored these many pages to establish will wonder why all the bother? The answer is that in these respects there is a monumental ambiguity in public policy, which reflects in part the ambiguity in the public pronouncements of relevant officials of the highest rank. Even those who preach the catastrophic decisiveness of nuclear strategic bombing seem to find it almost impossibly difficult to grasp the full significance of what they preach. Sir John Slessor, whose trenchant comment on what to expect from nuclear strategic bombing we have already quoted, furnishes an outstanding example. As a former Chief of Staff of the Royal Air Force, Sir John would have to be taken most seriously even if he did not merit it on the general urbanity and breadth of view so amply reflected in his writing. But he could also be abundantly quoted on the other side of the "decisiveness" question from the very same book — a book that has a special importance as perhaps the most lucid and comprehensive presentation of the "massive retaliation" doctrine to be found anywhere.

Sir John urges, to be sure, that "it is very seldom wise to carry things to their logical conclusions, and the airmen can no doubt rely upon their comrades of the older services to assist them in resisting that temptation."[7] Nevertheless, this distinguished airman, who regards it as "almost inconceivable" that a major war of the future fought with weapons of mass destruction (which he insists *must* be used) could last "for any length of time",[8] still considers it very important that navies be able to carry out their traditional functions of convoy protection,[9] which are defenses against attrition warfare and therefore strategically meaningful only over a considerable span of time. One wonders also why he considers it virtuous even now to profess disbelief in the thought "that air power by itself can defeat a first-class enemy."[10]

No doubt one answer is to be found in the only place in the book where Sir John portrays his conception of the United Kingdom under nuclear attack:

> "When things are really bad the people's morale is greatly sustained by the knowledge that we are giving back as good as we are getting, and this engenders a sort of combatant pride, like that of the charlady in a government office who was asked during the London blitz where her husband was — 'he's in the Middle East, the bloody coward!' We must ensure that defense, as adequate as we can reasonably make

[7] Slessor, *op. cit.*, p. 76.

[8] Ibid., pp. 107, 114.

[9] Ibid., pp. 92, 99, 101. See also Field Marshal The Viscount Bernard Montgomery, "A Look Through a Window at World War III," Journal of the Royal United Service Institution, (Vol. 99, No. 596), November 1954, pp. 507*ff.*

[10] Slessor, *op. cit.*, p. 106.

it, is afforded to those areas or installations which are really vital to our survival at the outset of a war, or to our ability to nourish our essential fighting strength. Much-Binding-in-the-Marsh and Littleville, Pa., are not in that category unless they happen to contain some utterly indispensable installation, and the inhabitants must steel themselves to risks and take what may come to them, knowing that thereby they are playing as essential a part in the country's defense as the pilot in the fighter or the man behind the gun.[11]"

There is only one thing to be said about such language and imagery: it fits World War II, but it has nothing to do with thermonuclear bombs. It certainly has no pertinence for the United Kingdom, which is both small in area and geographically close to the enemy. One does not have to think in terms of missiles of the future but only in terms of the V-1, the V-2, and the jet bomber to see the strongest possibility of a Britain in shambles at the end of the first hour of nuclear attack.

For countries such as the United States or the Soviet Union it would probably take a little longer. But there is no justification at all for the kind of easy optimism expressed in the following sentence: "But when it is suggested . . . that the United States could be knocked out as the arsenal of the North Atlantic Alliance, then writing as one who has been concerned for a good many years with air bombardment planning, I beg leave to say that it is nonsense."[12]

It remains to be added that in an article published two years after the book in which these remarks were made, Sir John Slessor was seeing things in a quite different light.[13] Among the events that had intervened between the two publications was the release of a good deal of information about thermonuclear weapons and their effects, but one must also give due credit to Sir John for a flexibility of mind that is no doubt among his special distinctions. Perhaps there is also something about the experience of being an author, especially the author of a book, that brings one intimately into the rough-and-tumble of the marketplace so far as ideas are concerned. Anyway, the kind of drastic conversion that Sir John underwent within two years regarding some of his fundamental beliefs is not a common occurrence among his professional colleagues, especially among those still on active duty. As Sir John observes in the aforementioned article: "Not many people, even in the fighting services themselves, have really grasped the full tactical implications of an age in which nuclear power is the dominant strategic factor in war. There is a tendency almost subconsciously to shy away from those implications, which should not be ascribed merely to the influence of vested interest."

The Need for Consistency

The sense of Emerson's famous remark about consistency being the hobgoblin of little minds has on the whole enjoyed remarkable verification in military history. Historical examples of unintelligent rejection of the novel need not detain us, except possibly to note that the catalog is long. Much more interesting for our purposes are the instances where eager acceptance of the new is coupled, not only within the same organizations but often within the same persons, with stubborn insistence upon retaining also much of the old. These are the people who on the whole have come off best when the scores were in. For their very inconsistency has often provided a hedge against wrong predictions.

The intensely conservative or reactionary are always proved wrong, because changes in armaments over the past century have been much too rapid and drastic to offer any cover to those who will not adjust. But the occasional brilliant seers who have the courage of their convictions and the analytical skill to recognize and expose inconsistency when they see it have all too often been tripped up by one or more critical assumptions which turned out to be in error, and then their own consistency worked only to make their whole logical construction dangerously wrong, as was certainly the case with Douhet.[14]

No doubt a proper intuitive feeling for the hazards of prediction and for the terrible forfeits involved, in the military sphere, in finding oneself overcommitted to a wrong guess, is one of the reasons why military men as a group tend to put a rather modest value on analytical brilliance as an alternative to mature military judgment. Nevertheless, there is a limit to the amount of inconsistency that is reasonable, especially since in the world of nuclear armaments it may become, to say the least, exceedingly expensive. And if any one thing is clear from all the foregoing, it is that the strategy of "massive retaliation," as commonly understood, is, like the headsman's axe, rather too sharp a cure for ordinary ailments.

[11] Ibid., p. 120.

[12] Ibid., p. 34.

[13] See his "The Great Deterrent and Its Limitations", *Bulletin of the Atomic Scientists,* Vol. XII, No. 5, (May 1956), pp. 140-146. It is the emphasis on the limitations of "the great deterrent", and the policy implications of those limitations, that mainly distinguishes this article from his earlier book.

[14] See my article, "The Heritage of Douhet", in the U.S.A.F. *Air University Quarterly Review,* Vol. 6, No. 2 (Summer, 1953), pp. 64ff.

What's Our Line?

WING COMMANDER J. GELLNER

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NOT so long ago, in times less worrisome for the professional military man, serving officers could view present and future with equanimity. They knew that they were indispensable to the nation and they knew what they would do when the call to action came. As to the former point, their comfortable assurance rested on the supremacy of tactics (the preserve of the military expert) over strategy in the conduct of operations; as to the latter, on the predictability of the nature of the next war. The professional officer, if he was ambitious and conscientious, would work at making himself a master of military art and science. He did not have to worry whether or not he was studying the right art and the right science. Even less did he have to speculate about the rationale of his profession.

It is important to realize that it was only the ever growing difficulty of handling troops on the battlefield (tactics) which made the officer a professional man where before he was merely a member of a martial upper class of society. The size of the forces engaged, but even more the variety and effectiveness of the weapons which made it necessary to manoeuver rather than to rush to the attack, called for command by military experts. Their emergence coincided with the establishment of standing armies, or roughly with the campaigns of Gustavus Adolphus. At approximately the same time, the professional naval officer expert in seamanship, navigation, and naval tactics – the "tarpaulin" – began to replace the gallant, aristocratic amateur – the "gentleman" – in the command of men-of-war. [1] Military leaders from the XVIIth century up to and including the Second World War generally agreed in considering tactics as the part of their task more difficult and more important than strategy. Lord Wavell[2] illustrates this point by drawing an analogy from contract bridge:

> "The calling is strategy, the play of the hand tactics. I imagine that all experienced card players will agree that the latter is the more difficult part of the game, and gives more scope for the skill of the good player. Calling is to a certain degree mechanical and subject to conventions; so is strategy, the main principles of which are simple and easy to grasp . . . But in the end it is the result of the manner in which the cards are played or the battle is fought that is put down on the score sheets or in the pages of history."

In the realm of tactics any professional is superior to the most brilliant amateur. The story is told of how Machiavelli, the author of "The Art of War", failed miserably when trying to demonstrate his tactical doctrine in command of a regiment of landsknechts. Hitler, who without doubt had a flair for strategy, could probably not have moved a battalion. The more involved military tactics became the more indispensable became the experts in tactics, the professional officers. Their position was further strengthened by the growing complexity of the logistic problems connected with the administration and supply of huge and lavishly equipped military forces.

The advent of weapons of absolute destruction has brought with it a reversal of the order of importance of strategy and tactics in a nuclear war. Strategy – the art of bringing his forces to the battlefield in favourable position – will now obviously be the military leader's main concern. The tactics of an attack with nuclear weapons may be very simple: targets will clearly have to be predetermined in peace time and allotted to

(1) For an entertaining account of the period of transition from the fighting knights to the professional officers, read E. S. Turner, "Gallant Gentlemen". (Michael Joseph, London, 1956).

(2) In "Soldiers and Soldiering" (Jonathan Cape, London, 1953).

weapons carriers; the latter, even if manned, will have little scope for manoeuver; the destructiveness of the weapons will make accuracy a minor consideration. At any event, the forces which will deliver the knock-out blow will be small; they will start and be directed from a long-established logistic base. If the next war must necessarily be a nuclear one – and a series of pronouncements by Western military leaders indicate that we intend to counter aggression with nuclear bombardments of varying severity – then the importance of the military profession must inevitably decline. For strategy, and especially strategy in a nuclear slugging match, is not the exclusive preserve of the professional. Indeed, much searching inquiry into the requirements for and the conduct of future war, that is, much of the thinking in the realm of grand strategy and strategy, is done by men with backgrounds in military history, in philosophy, and in science, such as Bernard Brodie, Henry Kissinger, Warren Amster, Liddell Hart, to name but a few. They work in a field which, in the times of the pre-eminence of tactics, was almost entirely occupied by professional military men such as Clausewitz, Jomini, Moltke, and Douhet.

War itself has lost its traditional meaning. When the weapons used are nuclear bombs, war clearly can no longer be regarded as a "continuation of State policy by other means". Complete destruction, mutual suicide, are not policies. With enforcement now tantamount to murder, and almost certainly to murder and suicide, the professional "enforcer" has lost his traditional place in the apparatus of the State. He is called to action only for the final "Twilight of the Gods". Nor does the proposition [3] that "Military forces today are not designed to wage war; their purpose is to prevent it," sound convincing. The aim of the police is to prevent crime, of the medical profession to prevent illness. But a policeman would not be a policeman if he could not subdue a criminal, a doctor would not be a doctor if he could not cure a patient. What then of armed forces which could not wage and win wars?

The thoughtful professional officer of today thus cannot evade asking himself these basic questions: "What is my function in society?", and, "Am I really necessary for the proper functioning of society?". In other words, he must ask himself what the requirements for national security are in the nuclear age, and what he, and only he and others of his profession, can do to fulfil those requirements.

(3) Advanced by Mr. Harold Macmillan in his speech of 11 February, 1957, at a dinner given in London by the English Speaking Union.



Nuclear War, Unrestricted and Limited

A national policy and grand strategy based on the determination not to attack anybody, but to counter aggression with all weapons in one's own and in allied arsenals would be comparatively simple to translate into strategy, and outright easy to execute tactically. As no power or combination of powers which did not possess nuclear weapons could possibly tangle with one which did possess them (or with one protected by a "have" power), all that would be necessary would be to maintain a capability for retaliation with nuclear weapons sufficient to deter from launching an attack any enemy who also possessed nuclear weapons. Essential components of such a deterrent force would be the nuclear weapons carriers themselves, shielded by a defence organization designed to give warning of an approaching attack and, by forcing the enemy to fight his way through a defended area, to deprive him of the advantage which generally goes to him who strikes first. The amount of force necessary to

bring about a "deterrent state" can be determined with precision.[4]

The basic weakness of a national military policy such as that which we have just outlined becomes apparent as soon as "deterrence" is defined. It is "a method of forcing good (i.e. rational) behavior through the fear of self-destruction."[5] Hitler, in the Chancery bunker in April, 1945, was not rational and there was no threat that could have made him behave rationally. In fact, his wish was that Germany should join him in suicide, and he would have taken the world along had he known how to achieve this. There is always the possibility that we may be faced with an enemy ruler who cannot be deterred because he does not think rationally. Already at the present stage of weapons technology is it conceivable that a single madman could destroy humanity.

A much more serious objection against complete reliance on deterrence as a means of preventing war is that it not only deters aggression, but also resistance to aggression.[6] The temptation will necessarily be great to qualify enemy attacks with such adjectives as "local" or "minor", to give to the term "aggression" the widest and the most liberal interpretation, because a strict interpretation must lead to cataclysm. A grand strategy that calls for unrestricted nuclear warfare as a counter to aggression is essentially a bluff which an enemy could call in a succession of hostile acts, none serious enough to make retaliation with nuclear weapons likely, but each designed to give to the aggressor definite politico-military advantages. In this way, a power relying entirely on nuclear weapons could well be slowly throttled.

The concept of the "graduated deterrent" has been evolved as a seeming way out of this impasse. It envisages "threatening realistic retaliation against aggression only with weapons "graduated" to the scale of the attack."[7] These weapons would still be nuclear (Western military leaders, especially those of NATO, have said so, and, at any event, the conventional forces of the West as they are today would not be likely to deter Russia or Red China), but there would be limitations as to the quantity and quality of the weapons themselves, and the areas in which and targets against which the weapons would be used. The official grand strategy of the leading nuclear power in the West, the United States, is clearly no longer "massive retaliation" but rather "graduated deterrence". For instance, Mr. Dulles[8] has stated unequivocally that "our capacity to retaliate . . . would be selective and adapted to the occasion."

There are many who believe that a graduated deterrent is no deterrent at all[9] and that a declaration of graduated deterrence "could not do other than increase the risk of war". This is debatable. But even if we accept that limited nuclear warfare is a formidable enough threat to deter aggression, the difficulty still remains of envisaging how such warfare could be conducted if "graduated deterrence" in fact failed to prevent it, As we cannot rely on the enemy "playing the game", the only way of making him abide by the rules of limited atomic warfare (whatever they may be) is to let him know that we will match him nuclear weapon for nuclear weapon.[10] This looks fairly reasonable on paper, but is quite impossible in practice. With national survival at stake, we could not in every case wait and see what the enemy will do to us before retaliating in kind, as the next blow may deprive us of our capacity to retaliate. For instance, the commander in the UK could not wait to find out the intentions of a force of enemy aircraft approaching the shores of Britain, but would have to launch his V-bombers against their allotted nuclear targets.

In fact, limited nuclear war is only conceivable under the most absurd conditions, with both sides inspecting their enemy's forces before they are launched into battle, and with sanctuary areas set aside which not only must not be attacked, but must not even be approached. Above all, the retaliatory forces of both sides would have to be made completely safe from attack.

> "With a doctrine of limited war, many of the long cherished notions of warfare will have to be modified or abandoned. One of the cardinal principles of air strategy is that wars can be won only by dominating the air space com-

(4) See, for instance, Warren Amster's theories in his "The Design of a Deterrent Air Weapon System".

(5) C. W. Sherwin's definition. ("Securing Peace through Military Technology", *Bulletin of the Atomic Scientists,* May, 1956).

(6) Henry A. Kissinger in "Force and Diplomacy in the Nuclear Age" (*Foreign Affairs,* April, 1956).

(7) "On Limiting Atomic War" (pamphlet of the Royal Institute of International Affairs, London, 1956).

(8) In a speech on 8 December, 1955 (quoted from the *"New York Times"* of 9 December, 1955).

(9) For instance Sir John Slessor ("The Great Deterrent and its Limitations", *Bulletin of the Atomic Scientists,* May, 1956).

(10) It is interesting to note that this apparently is also how the Russians view an atomic war of the future – in a speech in April, 1957, Marshal Zhukov probably deliberately spoke of "bomb for bomb, missile for missile".

pletely. But any attempt to deprive an enemy of his retaliatory force would inevitably bring on all-out war. Confronted by the prospect that it will be completely impotent once its retaliatory force has been destroyed, a Power will almost certainly decide to use it to deprive its opponent of the means to impose his will. Thus the minimum condition for limiting war will be the immunity of the enemy's retaliatory force."(11)

Thus in a limited atomic war Great Britain would be safe from nuclear attack by being the sanctuary area of the V-bomber force. But practically the whole of Europe would be equally safe because the sanctuary areas, to be effective, would have to extend to a distance of at least 600 miles (one hour's flight for a jet bomber of today) from the British bomber bases on one side, and from the Russian on the other. These two circles would intersect. These sanctuary areas would have to be extended as attack speeds increased, until, with the advent of the ICBM, every point on the globe will be within one hour's flight of the attack weapon from wherever it is launched, and thus the whole Earth would have to be a sanctuary area for the retaliatory forces. As to the minute inspections behind the enemy lines, which would be a requirement in a limited nuclear war, it has been suggested that as a consequence the battles in such a war "will approach the stylized contests of the feudal period."(12)

We have said earlier that a war between a power which had nuclear weapons and one which did not have them is unthinkable, as there would be no contest and the "have not" would have to submit at once. It seems incredible that a war between two powers possessing nuclear weapons and determined to use them could remain limited as to area, targets attacked, and weapons used. The inescapable conclusion then is that any war with nuclear weapons must be fought all out, no holds barred.

One last point must be discussed before we leave the subject of nuclear war: the probable course of a contest of that kind. Field-Marshal Montgomery(13) has traced it with great lucidity and vividness. He sees the Third World War run through three distinct phases, of which the first two interest us here: Phase 1, or the Destructive Phase, and Phase 2, or the Exploitation Phase. The latter is often called the "period of broken-backed warfare". Montgomery does not say so outright, but from the results which he foresees it is clear that he believes that in Phase 1 the two sides will go at each other with all they have got. In this short nuclear slugging match the enemy is crushed; our side is badly crippled, but we "retained a number of piloted aircraft and missiles, and there were still some nuclear warheads left." Thus we emerge the victors. Thereafter, in Phase 2, military operations are only of secondary importance. Enemy forces are shepherded back to their homeland into which only short forays are made to destroy the remnants of the enemy's nuclear capacity. In the Exploitation Phase it matters little how our forces are armed – any serious resistance will be put down by the threat of nuclear bombardment which no longer can be opposed or repaid in kind. In this phase it is simply the case again of a power possessing nuclear weapons (albeit a terribly weakened one) imposing its will on a power which does not possess them.

This (now widely accepted) concept of the war of the future suffers from a basic weakness: it assumes that *all* countries possessing nuclear weapons will be engaged in Phase 1. Self-interest would dictate that a lesser power with nuclear capabilities would sit out this phase of the contest between the two world powers. In Phase 2, with nuclear strength unimpaired, it might then be able to impose its will on victor and defeated. At any event, even if it wanted to take sides from the beginning, such a lesser power might not have time to join in the fray before Phase 1 was over. At present only three countries possess nuclear weapons, and the Soviet Union would probably attack Great Britain in the same hour as the United States to forestall any possibility of an unengaged third party emerging the victor from the battle of the giants. In a few years, however, a number of countries may have nuclear capabilities and it will no longer be possible for an aggressor to destroy them all, in passing and as a precautionary measure, while aiming his main blow at the United States. That means that he who wants to win in a nuclear war must wage both unrestricted and global warfare. He must use the most destructive weapons in his arsenal and he must not spare any country which has nuclear capabilities.

In the planning and preparation for unrestricted, global, nuclear war, and in the fighting of it if it came, the professional officer would play a role, but by far not so important a role as in the past. It would be all strategy and no tactics. In the strategic field the technical expert would of necessity be more important than the military. The weapons carriers will be manned for some years to come, but the

(11) and (12) Henry A. Kissinger, "Strategy and Organization" (*Foreign Affairs*, April, 1957).

(13) In his lecture, "Panorama of Warfare in a Nuclear Age", delivered to the Royal United Service Institution on 10 October, 1956.

task of the crews will call for skill only, not for mastery of the art of war. Even their job will one day be done by robots. As was pointed out earlier, the acceptance of the concept of "nuclear war or nothing" must bring on the sundown of the military profession.

Small Wars — Old Fashioned Wars

It is clear that nuclear war must be avoided and that the states possessing nuclear weapons, provided they are ruled by rational men, will do all in their power to avoid it. Yet human conflict is unavoidable. Differences between various states and combinations of states are as acrimonious as ever. The two big Eastern dictatorships, the Soviet Union and Red China, are perhaps at the height or nearing the height of the dynamic stage of their development. There will be warfare in the future just as there is warfare today, most likely on the lines suggested by Liddell Hart: (14)

> "The enemy can exploit a choice of strategic techniques, different in pattern but all designed to make headway for the aggressor while causing hesitancy on the other side in taking the fateful decision to order counter-action with nuclear weapons. Such aggression might be made at a limited tempo — a gradual process of encroachments. It might be made at a fast tempo, but to a limited depth — small blitz bites swiftly made, and as swiftly followed up by a conciliatory offer to negotiate. It might take the form of stirring up internal revolt in another country, and then infiltrating or parachuting reinforcements of "volunteers". It might also take a purely subversive form."

It would be futile to assert that we will stop such creeping aggression with nuclear weapons, big or small, for we will not do that. Indeed, the sooner we admit that we have no option but to counter minor acts of aggression perpetrated by a power possessing nuclear weapons (the Soviet Union) or by others on behalf of that power with conventional arms, and the sooner we provide ourselves with enough of these arms (and the men to handle them) for effective resistance, the safer we will be. And the more likely will it be that peace will be preserved.

Let nobody say that we could never match the East in manpower or conventional arms. The population of Western Europe alone is greater than that of the Soviet Union. There is no point counting Chinese heads. For many years to come the United States will be able to field *effective* (properly equipped, armed, trained and supplied) military forces stronger than Red China's. Nor are the costs of armaments beyond the capacity of the economies of most of the Western democracies — it is only our refusal to retrench elsewhere which makes them appear excessive. (15) The point is that we *must* deter limited (minor, local) aggression by brandishing conventional arms, because — at the risk of being repetitive we must say it again — nuclear deterrence is effective only against aggression with nuclear weapons, that is, against the threat of unrestricted, global, nuclear war.

A New Task: Peace Preservation

A minor war which may develop from limited aggression (in space or time) by the Soviet Union or Red China, or much more likely by a country which is a pawn of the Soviet Union or Red China, could lead to nuclear war. It would almost certainly lead to it if the West opposed such aggression with nuclear weapons. Even a conflict in which the interests of the powers possessing nuclear arms were not directly involved could, if it lasted too long and if it spread, bring about a clash of the giants. As nuclear war constitutes a deadly peril for all countries, belligerent and non-belligerent, it must be in the interest of all countries to prevent the outbreak of hostilities anywhere in the world, or to put a quick stop to hostilities that may have started. Living as we do under the sword of Damocles of nuclear war, *collective security* is a matter of utmost urgency and *peace preservation* everybody's business. It is the business of Canada perhaps more than of any other country because its geographic position makes it the battleground in a war between the two great world powers. Some countries may perhaps be able to ride out Phase 1 of a nuclear war. Canada certainly cannot.

Thus it is not surprising that Canada has taken the lead in developing the concept of peace preservation as the principal politico-military task, and that Mr. Lester Pearson is the foremost exponent and propagator of that concept. The idea is, of course, not new. It appeared in the Covenant of the League of Nations, and was embodied into the Charter of the United Nations, article 43 of which

(14) Capt. B. H. Liddell Hart, "Dependence on H-Bomb Saps Will to Resist" (*Globe and Mail,* Toronto, 26 March, 1957).

(15) For an interesting estimate of what the West should spent for national security and evidence that it can afford to spend it, see Allan F. Matthews "The Cost of Preparedness and Risk of War" (*Bulletin of the Atomic Scientists,* February, 1957).

provides for the basic machinery for the practical implementation of the principle. Except in the case of Korea, when the fortuitous circumstance that the Soviet Union just happened to boycott the Security Council enabled that body to perform the task for which it was designed, the United Nations has never been able to enforce its peace resolutions. Only on that occasion was the world body able, to use Mr. Pearson's words,(16) to put forceful "international action behind international words". UNEF, useful as it is under the circumstances, is clearly not an effective peace preservation force. It did not stop the war between Israel and Egypt, nor would it have been capable of stopping it. This was done by the Anglo-French intervention despite rather than on behalf of the United Nations.

It would obviously be highly desirable that a military force should exist, impartial, motivated only by its sense of duty to preserve peace, always available and highly mobile, strong enough to beat out any spark of armed conflict. As an alternative solution (and one more practical because more easily attainable) the United Nations should be able to call on a member country to go and preserve peace in this or that part of the world. Such national forces, operating under a United Nations mandate, should again be fighting forces capable of reaching the trouble spot quickly to impose peace upon the belligerents or would-be belligerents, if need be by force of arms. Mr. Pearson clearly contemplates the use of either one of these methods, or perhaps even of both, but as a practical statesman he approaches the problem cautiously:

> "Even if governments are unable to give the UN a "fighting" force ready and organized to serve it on the decision of the Security Council, they should be willing to earmark smaller forces for the more limited duty of securing a cease-fire already agreed upon by the belligerents. We might in this way be able to construct a halfway house at the crossroads of war, and utilize an intermediate technique between merely passing resolutions and actually fighting . . . The first step would seem to be to create a permanent mechanism by which units of the armed forces of member countries could be endowed with the authority of the UN and made available at short notice for supervisory police duties."(17)

It is clear that this "halfway" solution must be followed, as quickly as that can be done either through the cumbersome procedures of the United Nations *or* by the initiative of countries which have a vital interest in preserving world peace, by peace preservation forces capable of pushing belligerents apart instead of merely keeping them apart. The main characteristics of such forces should be uncommonly great firepower (without nuclear weapons) for the number of personnel employed, and the highest degree of mobility. Expert leadership that would be imaginative and would combine prudence with forcefulness would be necessary, as well as purposeful and courageous political direction.

Our Line

From what has been said here, the following grand strategy for the West emerges:

1. We must deter nuclear war by maintaining a strong nuclear retaliatory force shielded by an effective defence system.

2. We must state unequivocally that we will counter any attack with nuclear weapons with all we have got (we may as well do that as nuclear war must quickly become unrestricted and global, anyway), but also that we will not use nuclear weapons unless the aggressor uses them.

3. We must deter any war by maintaing strong conventional forces.

4. We must earmark a particularly heavily armed and completely mobile (air transportable) portion of our conventional forces for peace preservation anywhere on the globe.

Such a military policy would free us from the mesmerizing and debilitating effects of complete reliance on nuclear weapons to ensure national security. It would go a long way toward making armed force again, as it used to be, a legitimate extension of diplomacy. It would help to keep world peace more effectively than dark threats of megaton-yield bombs. The implementation of such a grand strategy would make the greatest demands on the professional men who would have to execute it. The military profession has for years now tended to become a learned profession. Those who in the nuclear age are called upon to ensure national survival by maintaining peace and winning wars if need be (for wars can still be won, albeit perhaps not nuclear wars) will have to be men truly learned in the military art and science. Nothing less will do.

(16) In his speech to the Commons on 14 January, 1957.

(17) Lester B. Pearson, "Force for U.N." (*Foreign Affairs*, April, 1957).

Air Power and Future Wars

J. I. JACKSON

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I. INTERCONTINENTAL THERMONUCLEAR WAR

AIR POWER today is still dominated by the thermonuclear or hydrogen bomb and the high performance bomber. The H-bomb enables a single bomber to obliterate the largest city and poison a vast area with radioactive fallout, and we need only recognize the vital function of great cities as centres of administration, communication, and distribution to realize that but fifty or so bombers could destroy the civilized order of a major power such as Russia or the U.S.A. This great damage, that is to say, could be brought about by some fifty bombers plus as many others as might be needed to absorb losses to the defences.

These losses should hardly be prohibitive, even when missiles and atomic weapons are added to the defensive arsenal. Even if they were as much as fifty percent, a highly presumptuous figure, it would still mean that only 100 bombers could deliver the decisive attack. A force so small can be deployed with great secrecy and speed and can be modernized quickly to incorporate technical advances. It has above all great tactical advantages of surprise. We can say with certainty that intercontinental bomber forces could not be stopped from destroying utterly any nation they attack.

The Concept of Immediacy

If we can draw any one conclusion about the significance of the H-bomb/modern-bomber weapon, we can say that it contracts time to produce an immediacy of effect. This characteristic of immediacy pervades any discussion of intercontinental air war (and indeed any discussion of air power today), forcing us to reconsider many of the most important doctrines that have guided our thinking.

First is the unacceptability of the idea that any kind of "broken backed" war could be carried on after the attack had taken place. Those who believe thermonuclear attack merely breaks a nation's back are too optimistic. Such an immense effort would be needed to succour what life remained in the nation; so little will to fight would persist even if it had not been supplanted by revulsion against all military effort; the lines of civil and military authority would be so broken down that the direction of any warlike force would be out of the question. It might be possible to organize small, ill-equipped bands to continue the bloodletting to a point of complete exhaustion, but the purpose of such activity would be obscure. Battle to the last man may be admirable in a tactical situation; as a basis for strategic planning it is atavistic. One must not underestimate human tenacity but one cannot, even with the limited evidence of Hamburg, Hiroshima, and Nagasaki, put aside the paralyzing effects of immense and immediate destruction which in future war would be nation-wide.

The second aspect of immediacy is the change it imposes on the whole idea of air defence: The idea of the classic strategic "air battle", and probably the concept of air superiority as well, are cast into obsolescence. One reason for this is that increased speeds have quite changed the nature of air combat. Speed has given the weapons of air combat — the bombers, interceptors, and the many types of missiles — something of the invulnerability of projectiles such as the bullet. The weapons are not yet wholly such projectiles, for they operate in a volume of space large enough, in relation to their speeds, to permit some tactical manoeuvre. Their speeds however are too great for human detection, calculation, or even judgment. Thus information must be gathered electronically, calculation done by computing devices, and command tactical orders sent electronically. In this operation the human being performs automatically, or at best according to procedures designed in advance to suit foreseeable circumstances. The tactical manoeuvres of the weapons, this is to say, are predetermined, and the

very complexity of the electronic system militates against flexibility even if the speed of action allowed human resourcefulness to function. In this situation the tactical duel evolves into a struggle for the control of the guidance transmissions; a struggle between the ground control station to locate the bomber and the bomber to evade accurate detection, between the interceptor to guide his missile toward the bomber and the bomber to mislead the missile.

The second reason for the demise of the "air battle" is that the power of the H-bomb has changed the purpose of air combat. The bomber no longer tries gradually to reduce the enemy heartland to rubble; the interceptor no longer tries to impose cumulatively unacceptable losses on the bomber. The bomber force needs to attack but once, and in the space of two or three hours its victims can be demolished. The air defence weapons can at best interfere and harry; they no longer *defend* to any effect. Their prime role is performed not in battle but before, in making the attacker realize he can not expect an easy encounter or allow himself to use obsolete equipment.

The only even mildly effective defence is in the attack not taking place, and this protection is not military but psychological or moral, depending on making the owner of the thermonuclear force reluctant to attack. Thus the real air defence is the thermonuclear retaliatory or counter force, supported by the radar warning system that will allow it to take off before it can be destroyed on the ground. The defensive interceptor and electronic weapons are no longer the teeth of the air defence system, but rather comprise a subsidiary arm of the warning net, and have the same purpose in this as civil defence and defence against missile-bearing submarines in helping to dissipate the casualties of the attack.

The Concept of Sanctuary Areas

When thermonuclear attack can obliterate the largest nation and when the inevitable consequence to the attacker is retaliatory obliteration, a grand strategic impasse prevails. Intercontinental thermonuclear attack becomes no longer a method of war, in the sense of war being a means to gain ultimate political advantage; it is now simply the precipitation of a holocaust that would wipe the great powers from the globe, contaminate vast areas of the earth, and leave such neutral nations as survived to attempt the salvage of a probably blighted race.

There are many ways in which the holocaust might be initiated, and perhaps the most dangerous is from a misunderstanding of a kind very prevalent today about what can and can not be done militarily and politically in the presence of modern weapons. Militarily, however, there are quite specific conditions determining when the holocaust is inescapable. Militarily, we can say that the holocaust is avoidable until an attacking force is at a point where the time it needs to reach the counter force bases equals the time (plus a safety factor) for the counter force to become airborne. A line may thus be drawn around each great power which no force may penetrate without causing the despatch of the counter force. The areas enclosed by these detonator lines would be inviolable sanctuary areas, secure from attack so long as the defence system protecting it was modern and in constant readiness.

The placing of these lines would be a study in itself, and would depend mainly on the time needed to launch the counter force. However the defence commander would be far less likely to precipitate the holocaust by miscalculation if this time were a minimum, if his early warning intelligence were good, and if his interceptors could identify random penetrations. The radar warning system and its subsidiary weapons would play their most important role in defining for the commander any unidentified air activity going on around the detonator lines.

The Problem of Europe

One part of the world – Europe – lies within the sanctuary areas of two great powers. In Europe it would be impossible for either Russia or the United Kingdom to be sure from the evidence displayed on their radar screens that any air activity was not a threat to their counter forces, and thus any military air activity would bring down the holocaust. It is hard to believe that today's discussions about how Europe can be defended are militarily of more than academic significance, for questions of the deployment and tactics for European defence would be of trivial importance once the intercontinental bombers had done their work. The greatest danger of the holocaust today may lie in the minds of those European leaders who have not grasped the relationship between European conflict and intercontinental war, and who may be willing to pursue national ends without being aware of today's military realities.

II. FRINGE WAR

If the spectre of the holocaust protects Europe and the great powers from nuclear war, we can not assume the same immunity is spread across the rest

of the earth. Indeed the presence of lines clearly demarking sanctuary areas allows considerable military activity outside these areas without automatically risking the holocaust. The only way in which this military activity might lead to the holocaust is in the non-aggressor being unprepared to cope with it: when his only weapon is the thermonuclear force, and provocation accumulates to the point where he embraces suicide as a moral or emotional catharsis.

Not many years ago a warlike incident in a distant part of the globe could mean immediate declaration of full-scale war between the great powers, but the supreme commander of today can hardly act so precipitately. If one of his distant outposts were captured suddenly or destroyed by atomic attack he might be expressing perfectly his country's indignation in ordering off his intercontinental bombers. But he would surely stay his hand, knowing he would be bringing oblivion to his nation for the sake of that outpost. To be more specific, it does not seem conceivable that the obliteration of a distant S.A.C. base or even the sinking of a great task force, enormous provocation as such acts would be, would be grounds for the West to sacrifice New York, London, Washington, Chicago, and sixty or seventy of the largest Western cities. If the certain loss of these cities were not in itself a sufficient deterrent to such rashness, there would seem no grounds simply because there would be nothing to gain militarily or politically from the holocaust, and dim chance of gain after it.

Atomic Fringe War

However, if the vulnerability of concentrated forces in the unprotected areas suggest such forces should be retained within the sanctuary areas, the West will probably still have to take part in "fringe" wars occurring along the arc drawn from the Middle East through Southeast Asia to Korea, where the interests of the great powers abut. In many of the studies of what forces should be readied for fringe wars there is an assumption that the use of atomic weapons in such operations would risk starting thermonuclear global war. Although atomic weapons are seen as simply very powerful explosives with poisonous side-effects, some people have attached to them an additional moral significance which is seen to enlarge their impact to the point that they are almost certain to touch off the holocaust.

It is unfortunately likely that this restraint upon the use of atomic weapons may no longer apply. To repeat our illustration, which we must keep in mind throughout our discussion, a supreme Western commander would hardly write off his civilization because a single fleet had been sunk in the Indian Ocean, nor would a Soviet commander write off his civilization because a people's volunteer division had been atomized in South East Asia. Intercontinental thermonuclear attack has become pointless as retaliation for anything short of penetration of the sanctuary areas.

Once atomic weapons *can* be used in fringe wars, the readying of purely "conventional" forces for such wars becomes extremely dangerous. Poison gas could have been used in World War II; it was not used, but the commander who neglected to prepare his troops for gas attack would have been a fool. Similarly, the mere existence of atomic weapons makes it necessary to ensure their use is not unanticipated. However whereas gas could for the most part be prepared for by providing small items of personal equipment, the preparation for atomic attack is wide dispersion and great mobility, which affect the whole size, character, tactics, and equipment of the force. And once these measures are taken the only way to stop an enemy approaching in mass is to use atomic weapons. It seems, therefore, that the mere possibility that atomic weapons can be used makes their use necessary. Certainly the commander who massed his forces, built up huge supply dumps, and trusted sacred international covenants to shield him from destruction would be showing the most questionable judgment. The crux of the matter is that he would have no second chance; atomic attack against conventionally deployed forces is immediately overwhelming, with every advantage going to the side which strikes first.

The popular picture of atomic war with its excessive sound and fury seems based on the clash of atom-armed but conventionally deployed forces. This picture is probably false, for atomic ammunition is not the kind of thing a wise commander would use liberally. For one thing, fall-out can be just as inconvenient to friend as to foe. Further, when the over-riding aim is to stop small nations becoming communist, no great sympathy is to be gained by slaughtering wholesale the population of such nations. Finally, and most important, when forces are properly deployed there simply would not be targets worthy of atomic attack.

Air Forces and Atomic Fringe War

The main factor determining the character of air operations in the theatre would be the vulnerability

of air bases to atomic attack and the impossibility of guaranteeing any kind of defence to airfields anywhere in the theatre. We would thus expect airfields to be deep in the rear areas to allow aircraft to clear their bases at the approach of the enemy. There would be many airfields, with only a very few aircraft on each, and with perhaps a quarter bare of aircraft at any one time. There would be a preference for aircraft that could take off and land on rough ground or highways, that could be disposed and hidden over a large area, and that could take off and land vertically. Indeed we can expect aircraft to be developed for their ability to exist within the theatre rather than primarily for their airborne performance. When large runways can be broken up or made radioactive, the Mach 1 fighter that can operate from a highway is more useful than the Mach 2 fighter that needs 10,000 feet of concrete for a home.

Generally speaking there would be far fewer aircraft within the theatre than in a war in which high-explosive weapons were used, and their tasks would be different from the tasks traditionally performed by air forces in a theatre. Close support to armies, for instance, would be mainly given by surface-to-surface missiles. We would expect aircraft to do much reconnaissance to spot any massing that might be vulnerable to atomic attack, and this activity would range over the battle area and also far behind it. This reconnaissance would go hand in hand with deep interdiction operations.

However the main effort in the air would be to defeat the enemy air forces. This may seem a conventional enough role; air forces have traditionally fought to establish air superiority, which was not an end in itself but rather a means toward the end of relieving armies from enemy air attack and bringing air attack on the opposing armies. Air superiority, or relative freedom of action in the air, was necessary because with high explosive weapons aeroplanes needed many attacks to injure armies. Air forces could dominate armies (and for that matter naval forces) if enough sorties could be flown; air forces gained their ends by the attrition they effected, and the air battle was fought to determine which side could fly the requisite number of sorties.

When air forces are armed with atomic weapons, however, the factor of immediacy which we have already related to intercontinental war appears. Even a handful of airplanes can not just damage but destroy a naval force or an army concentrated to a degree that it can be effective. And it is most unlikely, considering how difficult interception is made by high speeds, and the ability of a modern air force to reinforce quickly over long ranges, that any target can be immune. Naval forces, even when armed with interceptor aircraft and missiles, are unlikely to be able to survive atomic air-to-surface missile attack, though individual ships may be able to escape detection. Armies, deprived of their ability to concentrate, are unlikely to gain sufficient superiority in tactics to make significant advances against an enemy. It would seem, in fact, that the authority atomic weapons and missiles have given air forces over surface forces is for all practical purposes absolute. Thus the establishment of air superiority, as a means whereby air forces can aid the surface battle, has become an obsolete aim, for surface forces are at the mercy of the air regardless of which side can fly the most sorties. Air superiority, that is to say, has become an anachronism, and the general military aim within the theatre is now simply to defeat the enemy air forces.

The primary action in the fight for air superiority was always the air battle, a number of encounters between individual aeroplanes in the air; which as one side gained the ability to penetrate without too high losses extended to a secondary phase in attacks on airfields. In terms of the concept of immediacy the air battle in atomic fringe war would embrace simultaneously the whole conflict of one air force against the other. The encounters between weapons in the air would be similar to that in intercontinental war; numerous fleeting collisions fought according to predetermined tactics, with the greatest struggle being an electronic one. The electronic battle would not simply involve those transmissions used in the air conflict; it would embrace the attack, defence, and repositioning of equipment; the jamming of missile and navigation transmissions; and the maintaining of the whole complex intercommunication system which a widely dispersed and continually moving force would require. And the air battle would from the beginning include action against airfields and maintenance facilities, and the struggle to reinforce and supply the theatre and prevent the enemy strangling the forces operating in the theatre.

The armies for atomic fringe war would be neither large nor cohesive; rather they would comprise a dispersed collection of small, heavily-armed, self-contained tactical units each of not more than a few hundred men, supplied and moved either by helicopter or simple transport aircraft. The land battle would become an area battle, with continuous raiding activity in quick thrusts and withdrawals.

In this type of battle heavy armour and artillery might well prove itself too cumbersome and vulnerable. Without mass, tactics would become supreme, and the success of the army could well depend on its junior commanders, its tactical equipment, and its communications. The army's success would be measured against a simple aim; to hold ground. Restricted as this aim may seem, no more ambitious a role seems possible unless some marked tactical superiority were achieved.

Within the theatre supplies would move mostly by air, but perhaps also in a few small, fast, single ships. The chief naval role would be in moving such limited shipping, for convoys or carrier task forces could not be risked within the range of shore-based aircraft. The theatre logistics problem would be great and quite new; it would not be one of supplying immense quantities so much as of maintaining an uninterrupted flow of many different things to many dispersed places for almost immediate use. Depots and dumps would be replaced by speedy and continuous movement of materiel, and what storage there was would be small.

III. DISPERSED GLOBAL WAR

With the manufacturing and training sources lying in the sanctuary areas it may seem that atomic fringe war would be a melting pot into which each great power would pour its resources. One may ask what possible military aim fringe wars can have when no stop can be put on reinforcements and supplies.

We have already seen that the defining of detonator lines allows atomic weapons to be used in fringe war. For the same reason, military activity can now take place anywhere outside the sanctuary areas without danger of the holocaust, specifically along the lines of supply spreading across the globe. We can thus no longer think of fringe war as a problem merely of theatre deployment and action but as a global problem. The theatre aim will be to hold ground and maintain air strength while reducing the air strength of the enemy. The global political aim will be to bring the enemy to negotiate for limited objectives under conditions unfavourable to him. Militarily, this will probably be achieved by making his theatre forces too expensive to maintain or too short of men and materiel to carry on. The main military problem, this is to say, would be a logistics problem.

Far as these aims are from any kind of "unconditional surrender" with its connotations of idealogical triumph, they are the only aims realistic for the age of nuclear weapons and advanced air power. In the broadest sense, that of grand strategy, they impose new and complex demands on the highest level of command, which must be able at any moment in a swiftly changing scene to strike a balance and decide where fighting should stop and negotiations begin. In this balance must be counted continuously the immediate military tactical and strategic situation, the changes that can be anticipated, the immediate and anticipated state of reserves and manufacturing capacity, the state of the domestic economy, and the temper of the nation. In the West at least the appreciation of such variables will call for the highest order of politico-military leadership.

Long Range Air Battle

Before we can understand the shape a struggle for global supply lines may assume, we must examine something of the genesis of the present concepts for maintaining long-range logistics support. In World War II the lines of supply lay across both the Atlantic and the Pacific Oceans. The main threat was the submarine, and for our purposes the significant fact about the submarine was that it operated far beyond the ranges of its own aircraft. Under these circumstances the submarine could be fought by carrier forces lacking an interceptor component, by naval vessels without air cover, and by long-range shore-based aircraft which were low-flying, slow, and completely unarmed against air attack. There thus came into being one of the more stubborn paradoxes of air warfare; while the airman has traditionally insisted that he had to defeat the enemy in the air before he could begin attacking surface targets, his submarine-hunting brother has traditionally assumed the absence of an air enemy.

A study of the contemporary problem must, however, recognize some significant technical developments. Strategically, the most important is the increased range of aircraft. High performance bombers now can, with aerial refuelling, reach many of the largest globally dispersed bases. Of even greater import, however, very long range aircraft such as the four-engined Soviet turbo prop Bear can now cover even wider areas, which with the emergence of atomic power will have no limit. Tactically, the most important development is the air-to-surface missile with nuclear warhead, which gives such aircraft a good chance against the defences of fixed bases and the strongest naval units, and an indisputable ascendency over individual

ships. The submarine might remain a threat to the lines of supply if it can outwit modern detection and avoid atomic anti-submarine weapons, but the aircraft's ability to reconnoitre vast areas by radar would give it advantages over the submarine, and this with its missile striking power should make it the major weapon. We would expect too that the aircraft would carry air-to-air missiles enabling it to attack transport aircraft and low-flying anti-submarine aircraft, and electronic devices to avoid the surface-to-air missiles that could be used against it.

The invasion of the global air by very long range aircraft has wide implications. First, it is doubtful if permanent or large garrison bases would be defensible. If a great power needed staging points between its national territory and a fringe war theatre we could expect such bases to be temporary and secret. Secondly, it is doubtful if shipping could be relied on as a carrier. Even if supplies were carried within the theatre by air and to some intermediate point by shipping, that point of transfer would be vulnerable notwithstanding the unlikely event that the shipping had evaded the enemy's long range reconnaissance. In these global operations, as with operations within the theatre, dispersion and constant movement would be essential. Thirdly, when surface forces and surface carriers are overwhelmingly vulnerable, and when air carriers and air forces are vulnerable even if in a lesser degree to the long range aircraft, the long range aircraft must be attacked if the supply lines are to be maintained. In this global arena, as opposed to the intercontinental or theatre air conflicts, the volume of space is large enough to permit something resembling the classic air battle to take place, with some degree of air superiority being a prerequisite to the successful movement of supplies. We could thus expect the main feature of the struggle to maintain the logistics flow to the theatre to be a global air battle. Because of the distances involved and the dispersal necessary it would not necessarily be intense, but it would nonetheless be decisive. It would be, in effect, a dispersed global war.

Air Command

With the main action of dispersed global war being air action, with the main global carrier being air carriers, and with long range bomber action having become sterile, "strategic" air power takes on a new meaning. While as in World War II the forces involved in the air threat to the national heartlands must receive priority and all other forces must be ordered with regard to their needs, the true strategic air deployment will be the managing of forces for dispersed global war. This deployment would be mainly of transport aircraft to sustain the theatre operations; and of the ground radars, high-level reconnaissance aircraft, and interceptor aircraft and missiles to fight the air battle. It would involve too the command of the army forces setting up and protecting the radar, staging, and missile bases, and of the naval forces that might provide radar coverage, air navigation aids, and missile fire. We could expect all these elements to be in a more or less constant state of motion, with the transports moving beneath the cover of an air defence environment pathway which would be continually shifting its position.

There are two quite disparate implications of dispersed global war that deserve mention even in a broad survey. First, the great need for transport aircraft suggests the desirability of a large trained first-line reserve of heavy transport forces. Because of the complexity of air equipment the usefulness of reserves is extremely dubious for almost all types of air operations, especially in bomber, air defence, and anti-submarine work. However, while fringe wars should be smothered by quick deployment of forces in being and at full readiness, quick deployment is not always politically possible. The growth of fringe war to dispersed global war should be slow enough to allow the mobilization of at least well-trained reserves, and the relative technical simplicity of transport flying should enable reserves to be well-trained. This is not to say that modern transport flying is not technically complicated, but rather that the kind of transport flying needed for dispersed global war can not depend on elaborate facilities and equipment. There should be employment enough for commercial air carriers in maintaining the nation's internal economy and in ferrying high-priority cargoes, but the need for rugged and simple air transportation will be far more than can be met by present resources.

Secondly, the primacy of air power in dispersed global war suggests the need for air commanders and air staffs trained to assume the highest military direction. Surface force command has rightly had long experience at such a level, but the emergence of air power as the supreme weapon does not auto-

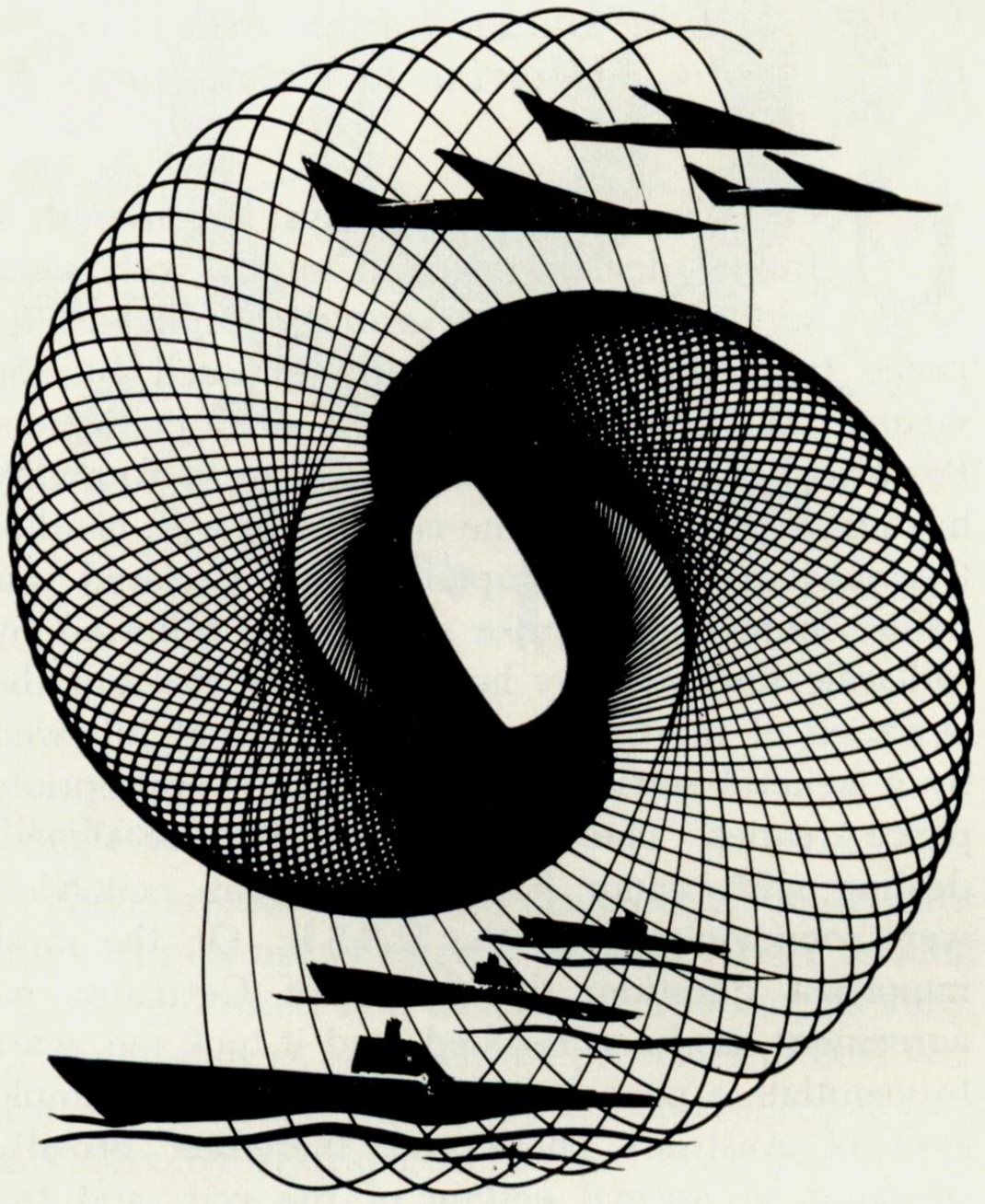
matically endow air command with qualifications for supreme leadership. Air Command has been independent only in "strategic" operations; elsewhere it has for the most part shared responsibility with surface force command. Seldom has it controlled surface forces and made the broadest military decisions, yet it is for such a level of direction that it must prepare.

IV. THE NEED FOR IMAGINATION

If we can create in our mind's eye this panorama of global conflict, with its distant theatres of concentrated operations, the dispersed yet continuous struggle along the lines of supply, and the sustained readiness of the thermonuclear air fleets, we may have a helpful vision of future war. We have seen that in such war the role of air power is central and pre-eminent, opening many new and challenging questions of organization, doctrine, and equipment. Now that immediacy has become so important a quality of war these questions must be resolved before action begins.

Much can be done by the routine testing of equipment and its use in tactical exercises. But the most important questions are matters of concept, of formulating broad designs giving proportion and place to the numerous parts and pieces, and this can come only through the use of imagination and enquiry, activities which are difficult to perform when so much effort is needed merely to operate the equipment pouring from the technical cornucopia.

In this situation there is a danger, especially if in harmony with the times we embrace the practical at the expense of the theoretical and speculative, that we prepare to use today's weapons according to yesterday's rules. Serious imaginative military thought is now neither impractical nor impracticable, but rather a necessity for survival.



"The most obvious lion in the path of the strategy of Pacifism is the prospect which Pacifists have to face that, in so far as their action might prove effective, its first effect would be to put States in which Pacifism was an appreciably strong political force at the mercy of States in which it was impotent; and this would mean allowing the most unscrupulous Governments of the most benighted military Powers to make themselves masters of the World in the first chapter of the story."

ARNOLD J. TOYNBEE

Air Control in the Cold War

AIR MARSHAL SIR ROBERT SAUNDBY

Air Marshal Sir Robert Saundby, K.C.B., K.B.E., M.C., D.F.C., A.F.C., F.R.E.S., retired from the R.A.F. in 1946, after thirty-two years of service. His writings cover a wide range of interest, but he is probably best known for his essays on the use of air power. His article "The Doctrine of Proportional Force" appeared in our last issue.

UNTIL recently wars always began with a formal declaration, and ended with some sort of cease-fire or armistice, followed by peace treaties which might be imposed by the victors, or negotiated between the belligerent Powers. But nowadays the last traces of formality have disappeared from the conduct of war. Neither Germany in 1939 nor Japan in 1941 declared war before launching surprise air attacks, followed by full-scale hostilities by land, sea and air; and the cessation of the fighting in 1945 was not followed by a general settlement embodied in appropriate peace treaties. The few treaties that were signed, dealing with minor Eastern European countries, were soon violated by the U.S.S.R. On the most important question, the future of Germany, no agreement has been reached, and it took ten years to negotiate a peace treaty in the relatively simple case of Austria. There was therefore, broadly speaking, no formal ending of the war, and the world has drifted into a new form of relationship between nations.

Before 1939 only two sets of relations between sovereign States were known – peace or war. International diplomacy recognized no other relationship, and if we were not at war with another country we were at peace with it. In time of peace reasonable standards of behaviour on the part of national governments were ensured by the knowledge that a serious lapse would be followed by an ultimatum which might lead to war. But the catastrophic violence that would nowadays accompany full-scale war has made the threat of it useless, except as a means of escape from a situation already desperate. The Communist and other aggressive and acquisitive States are well aware of this fact and rely upon it to enable them to carry on what is called "cold war," which can be defined as active hostility stopping short only of armed attack, and conducted under the cover of theoretically peaceful relations. The weapons of the cold war are direct propaganda appeals to peoples over the heads of their governments; the skilful exacerbation and exploitation of grievances and national prejudices; political infiltration and the incitement of subversion and rebellion; economic pressure and industrial sabotage. These weapons are so effective and so damaging that no country with any spirit would have endured a cold war offensive for long in the days before nuclear weapons, but nowadays it has to be borne lest worse befall.

The Failure of United Nations' Processes

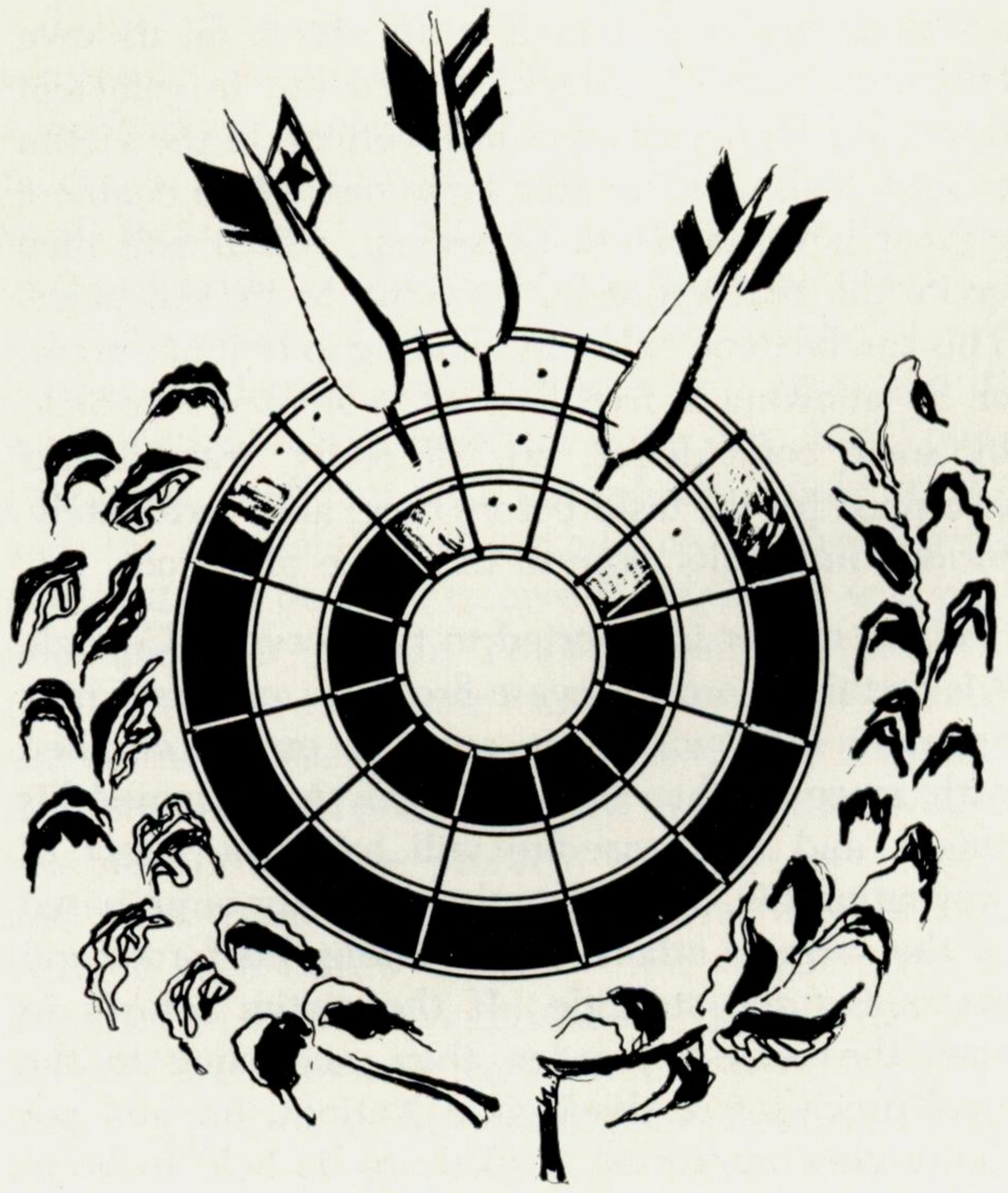
The free world, realizing the drastic change in the character of global war brought about by the atomic bomb, sought to replace the sanctions of national war by the peaceful moral and economic sanctions of the United Nations, though they realized that in extreme cases the use of armed force – internationally controlled and directed by the Security Council – might be necessary. This concept, which was based on the assumption that the permanent members of the Council, including the U.S.S.R., would be unanimous in their efforts to secure justice and uphold the rule of law, has proved illusory.

The U.S.S.R. has consistently employed the veto in the Security Council to further its declared policy of Communist world domination, and has not hesitated to use it to prevent the Council from taking any action that would conflict with its national interests. The Russian use of the veto has not only prevented the Council from punishing aggressors, but it has usually made it impossible to clarify the issues by naming them.

On the occasion of the Korean war, which is often cited as an example of effective action by the Security Council, the Russians were temporarily boycotting the Council and were therefore unable to exercise the veto. They are not likely to repeat that mistake.

The reduction of the Security Council to virtual impotence has led to the practice of submitting security matters to the General Assembly. The Assembly, however, can only make recommendations, and these must be carried by a two-thirds majority. The Communist States and Afro-Asian bloc, which is being enthusiastically courted by the Communists, now control more than one-third of the votes in the Assembly, and it is therefore difficult to pass even a recommendation commenting adversely on a Communist breach of international law.

The General Assembly is not therefore, in practice, an effective substitute for the Security Council. Moreover, it would appear that under the terms of the Charter, it is inhibited from taking action on matters within the jurisdiction of the Security Council. The relevant clause (Article 12) reads as follows: "While the Security Council is exercising in respect of any dispute or situation the functions assigned to it in the present Charter, the General Assembly shall not make any recommendation with regard to that dispute or situation unless the Security Council so requests."



The Unlikelihood of Reform

The fact is that the present constitution of the United Nations has proved to be unexpectedly convenient for the purposes of international lawbreakers, and it is therefore most unlikely that any reform of the Charter could be agreed upon.

In addition to these grave constitutional defects, the attitude of the Secretariat of the United Nations, which is inclined – and perhaps obliged – to take a purely legalistic view, assists in making the world safe for aggressors, provided that they obey the rules of the game. The United Nations ignores the cold war; it can see no threat to peace in the flagrant interference by one country in the internal affairs of another; it takes no notice of violent propaganda and abuse, of the fomenting of rebellion and subversion, or of economic and industrial sabotage. It is the resort to arms that is the unforgiveable sin. If any nation, goaded beyond endurance by a long series of hostile actions and threats of annihilation, should resort to force to end an intolerable situation, it will be branded as an aggressor unless one of the permanent members of the Security Council should use the veto to prevent it.

Eleven years of the cold war has produced a state of international tension, and a degree of organized hatred and ill-will between nations, that is unprecedented in the history of the world.

The Vicarious Use of Force

There are, however, two principal techniques for the vicarious use of force by a great Power seeking to use aggression as a means of furthering its aims, in circumstances in which the processes of cold war are ineffective or too slow, without encountering any effective restraint from the United Nations or having to make unblushing use of the veto to protect an obvious aggressor. Such a resort to force will occur only in situations where the risk of provoking a general war is considered to be slight.

The first, or indirect, method involves the instigation, in a neighbouring country, of an attempt to seize power by a minority by means of a sudden revolt or coup d'état. If the agents of the aggressor can gain access to the levers of power, even for a few hours, they can call in his armed forces to "suppress the counter-revolution" and "restore order." Posing as the de facto government of the country, they can insist that the aggressor's armed forces are there at their express invitation, to protect the people from terrorists and counter-revolutionaries. The United Nations, which recognizes only overt aggression, is unable to take any action.

The second, or direct, method makes use of open aggression. A small Power, acting as the agent of the real aggressor, can make a sudden surprise attack on a neighbour, at the same time loudly

asserting that it is repelling an attack on its own territory. Such an attack, carried out in sufficient force and supported by a fifth column in the victim country, can seize an area large enough to enable a puppet government to be set up, which will then invite the real aggressor to come to its assistance. This can be done either by sending in regular forces, or by allowing a free flow of "volunteers" which, by some coincidence, are all ready, trained and equipped for the tasks before them and, fortunately, formed into units close to the scene of action.

If the matter is reported to the Security Council, it is certain to order a cease-fire. The aggressor may be more than willing to see this order complied with, since by then he will largely have gained his object, and the cease-fire will have the effect of preventing his victim, caught relatively unprepared by the surprise attack, from rallying his forces and continuing the struggle. If the victim refuses to obey the cease-fire order, then, according to the legal processes of the United Nations, he, and not the original aggressor, is likely to be held to be in the wrong and to be defying the Security Council. If the Council should order the aggressor to withdraw, the puppet government will explain that the aggressor's forces are – with its consent and, indeed, by its invitation – helping to "liberate" the country. The United Nations can do nothing more and has to accept the fait accompli.

It is easy to think of successful examples of both these methods. Korea, a good instance of the second method, was nearly successful and failed only because of a combination of circumstances unlikely to be repeated.

Piecemeal Aggression

It will be seen that these methods can work only when the victim has a common frontier with a Communist or Communist-controlled country, across which armed forces can be moved. The incitement of subversion by itself can be the cause of a great deal of trouble and expense, as in Algeria, Kenya and Cyprus, but if it is not supported by military intervention it is not likely to succeed in establishing Communist domination. This can be achieved, in these circumstances, only through the relatively slow stages of self-government and self-determination. But almost every country that falls under Communist sway opens up a new frontier, and exposes to mortal danger a contiguous country. It is therefore vital for the freedom and well-being of the human race that the process should be stopped.

It has been stopped in Europe by making it clear that serious acts of aggression could, in no circumstances, be confined to specified areas. In other words, the full-scale nuclear deterrent has been in operation to prevent even local and limited war. This deterrent has been exercised, however, not by the United Nations, but by the North Atlantic Treaty Alliance. To be more precise, it was exercised by the U.S. Strategic Air Command until the arrival of our own nuclear weapons, since when it has been the joint responsibility of the U.S. and the Commonwealth. For nearly nine years the deterrent power of these Western air forces has halted Communist aggression and kept the peace in Europe.

But the doctrine of massive retaliation cannot be made to apply everywhere. The security of Europe is of such paramount importance that it is reasonable and practicable to guarantee it by the threat of the great deterrent. Yet it would be neither practicable nor desirable to meet serious acts of aggression everywhere by resort to full-scale warfare. To do so would be to ensure that any major breach of the peace, in any part of the world, would end in a thermo-nuclear holocaust. To avoid this the doctrine of graduated deterrence, or suiting the degree of force to the occasion, has been put forward. There is nothing new about this doctrine; it has always been the aim of strategy to use no more force than is necessary to gain the object. It is only when an attempt is made to equate this doctrine with the doctrine of minimum force, well known in civil laws, that new and dangerous possibilities arise. Such an attempt would be likely to lead to hesitation and indecision, to the mistake of applying too little force too late and thus to risk defeat.

An Analogous Situation

The situation today has some analogies with that which existed in the Middle East after the First World War. The crumbling of the Ottoman Empire, which had ruled the Arab countries for so many centuries, released a pent-up flood of nationalism, religious fervour, political ambitions and dynastic intrigues. The sudden disappearance of the age-old Turkish authority, with its semi-feudal discipline and long established laws and customs, gave to the newly created Arab States a heady sense of freedom, which soon gave way to licence and a contempt for the rule of law. Numerous petty rulers, sheikhs, and tribal chiefs saw opportunities of aggrandizing themselves at the expense of their neighbours, and inter-tribal wars and religious feuds were rife. Nor did this turbulence end there; in Iraq, especially,

organized rebellion on a large scale against the government created a military situation of considerable difficulty.

After the war Britain had received from the League of Nations mandates to rule Iraq, Trans-jordan and Palestine. These, with Egypt, the Sudan, and the Aden Protectorate, created a very large area of British responsibility in the Middle East, the unsettled state of which required the presence of a large number of troops. The material advantages to Britain of undertaking the operation of these mandates seemed negligible, and the cost was far greater than the country was willing to bear. Oil had not yet been found in quantity in any Arab country, and the Suez Canal and the Anglo-Persian Oil Co. were our only major interests in the area. A great public outcry arose in Britain, urging that we should hand back the mandates to the League of Nations, cut our losses and clear out of the Middle East, except for our forces in Egypt, stationed there under our Treaty rights in order to guarantee to the world freedom of navigation and good management of the Suez Canal.

The British Government, however, knew that if we were to do this the whole area would be submerged in a torrent of national and civil wars, rebellions, and massacres. In particular, we were unwilling to abandon to their fate the Jews in Palestine, where, in answer to Zionist entreaties, we had allowed a Jewish community to settle. We knew that, if we left, this community would be expelled and its property expropriated, even if it were not massacred.

In many ways this area resembled, in microcosm, the world today. There was the same intolerable tension, the product of inflamed nationalism, political opportunism, and the sudden removal of restraints; the same unsettled state of mind caused by the incidence of social and political changes and uncertainty about the future; and the same acute problem of maintaining law and order, and restoring peace and security, without paying a great price in lives and money.

The Proposal for Air Control

In 1920 a conference was held in Cairo under the chairmanship of Mr. Winston Churchill, who was at that time acting temporarily as Secretary of State for both War and Air. The problems seemed insoluble, until Air Marshal Trenchard, then Chief of the Air Staff, put forward his proposals for the air control of undeveloped countries.

These proposals, which were based on a new conception of control without occupation, offered a method of discharging our responsibilities at a moderate cost, and with every possibility of a very small loss of life. The saving in money – the cost of Trenchard's scheme was less than one-third of any alternative, with prospects, if successful, of further substantial savings – was very great, but it was a new idea and involved some risk. But Trenchard was confident that the scheme would work, and Mr. Churchill had confidence in Trenchard, and so it was decided to give it a trial. It was put into operation in Iraq, Trans-Jordan, and later in the Aden Protectorate, and was immediately successful, surpassing the claims made for it by the Air Staff. It could not be applied in Palestine, which was mainly a police problem – to prevent Arabs and Jews from cutting each others' throats and burning each others' houses – nor was it given a fair trial in India. Conditions on the North-West Frontier were, indeed, very suitable for the operation of air control, but traditional Army methods had been in use there for so long, and the Army was so jealous of its responsibilities, that in spite of the efforts of many wise civil administrators, it proved impossible to adopt the air method.

Trenchard's plan for air control was, like all his conceptions, essentially simple. It envisaged a system of supervision by resident political officers, controlling a native police force, and backed by centrally situated air forces. In addition, a small reserve of British troops and native levies would be retained at the central garrisons for airfield defence, and be available to be transported by air to support the police whenever necessary. Trenchard took the view that all disorders begin in a small way, and that if the forces of law and order could reach them as soon as they appeared, they could be quickly and easily dealt with. It was the duty of the police and the political officers to report at once any incident likely to endanger peace and security, and initiate appropriate local action. To take an example, let us suppose that a tribal sheikh, living in a village 120 miles from the nearest air force station, has raided a neighbour, killed some of his tribe and carried off food, cattle, and rifles. The political officer will send a force of police to arrest him and bring him before a court of justice. If the offending sheikh resists the police and declines to submit himself to the processes of the law, the political officer will report the matter immediately to Headquarters, and ask for appropriate action to be taken. The sheikh will be told that unless he surrenders to the police within a specified period,

say seven days, his village will be bombed from the air. The time and date at which the bombardment will take place are made known not only to the sheikh, but also by every possible means to the people of the village. They are warned to evacuate the village in order to avoid the danger, and they are told that the bombardment will not cease, and that it will not be safe for them to return, until the sheikh has surrendered to the police.

At the appointed time, the bombardment will begin. It will be continued, by occasional attacks and by the use of delayed-action bombs, for as long as necessary. When the method was first tried, it was found that sheikhs and their tribesmen were very stubborn, and it might be necessary to maintain an air blockade of a village for several weeks. But they had no answer to the air blockade. They could not tolerate being kept out of their homes indefinitely. It was not necessary to kill or wound a single tribesman, or destroy a single house, to enforce an eventual surrender. When that came, the sheikh would be arrested and brought to trial, and police, levies, doctors and medical orderlies would go peacefully to the village to restore public order, tidy up damage, bind up wounds and generally heal the breach of the peace.

When air action of this nature had been taken against an offending tribe and had led, as it invariably did, to surrender and rehabilitation, it was rare indeed to have to repeat it. The mere threat of air action would suffice to ensure compliance with law and order.

Because the bomb is a relatively new weapon, lacking the traditional respectability of the shell, the bullet, and the bayonet, and because air power operates in a new way, Trenchard's methods of air control aroused a good deal of opposition among well-meaning people ignorant of the way in which it worked. It was represented as savage, inhumane, and inefficient, and likely to leave behind it a legacy of hatred and malevolence. The very opposite, in fact, happened. It proved to be vastly more humane and efficient than the older Army method, and the lack of resentment shown by those who had been subjected to it was remarkable.

Disadvantages of Occupation

The chief defects of the Army method were that, owing to the time needed to organize a column to penetrate a long way into hilly, hostile, country and the cost of such an expedition, the troops did not usually begin their operation until the trouble had become really serious. Then the troops had to traverse the distance — often considerable — from their cantonment to the scene of the disorder. As tribesmen dislike having their territory invaded by troops, even though the troops are concerned only to pass through it on the way to their objective, it was normal for the column to have to fight every mile of the way there and back. The troops therefore became involved in hostilities with a lot of people with whom they had no quarrel, and their progress was delayed. In mountainous country any slackness in carrying out the tedious routine of picketing the heights, or any miscalculation or unforeseen mishaps causing a shortage of food or ammunition might well — and often did — lead to disaster. Our troops were often in a situation so desperate that they had to fight for their lives, and conflicts as bloody and bitter as any that the annals of war can show are to be found in the history of our operations on the North-West Frontier of India. When the troops reached the area in which the offenders lived, they would find no one there, and would be driven to punish them by destroying their forts and villages. Such operations may not have left a legacy of hatred, but they certainly created an atmosphere of unremitting hostility and strife. By contrast the air method allowed us a security so great that we could and did apply, at the right place and nowhere else, just the requisite degree of force needed to achieve our objects — humanely and without haste, and without the cruelty that often springs from weakness. The bomb, almost the symbol of destructive violence, had been tamed and made to serve the purposes of law and order, and to save lives and property in the process.

Modern Application of Air Control

It is not surprising that there are many who look back at the great success of air control in solving the difficult problems of maintaining order in undeveloped countries, and wonder whether some modification of that system would not serve to re-establish respect for justice and the rule of law in many parts of our disordered world today. The system of air control is based upon four main factors; good intelligence, secure well-sited airfields, efficient air power, and the possession of a weapon that can force the most irreconcilable into submission without serious loss of life or property.

Are any or all of these factors present to-day, or, if not, can they be created?

The first factor presents no difficulty as all countries maintain Foreign Offices in close touch with world affairs through a network of resident

diplomatic officials, and also possess a military intelligence system. There is seldom any doubt about what is happening and why.

The second factor, secure bases, is also usually present, but it can be safeguarded if necessary by making it clear that any attack upon our main bases would at once destroy the limited character of any conflict, and might be met by full-scale retaliation.

The third factor, effective air power, includes the possession of strong air forces and the ability to operate them as required. The first point offers no difficulty, as the free world possesses ample air power for such purposes. The second point involves the establishment of a sufficient degree of air superiority to enable the controlling air forces to operate at will. Aircraft engaged in the air control of undeveloped countries had no air opposition to contend with, and they were in danger only from small arms fire from the ground. But in some situations nowadays we might encounter air opposition. It is not possible to lay down a standard method for dealing with this, since the measures needed would depend upon the circumstances. In some instances a strong escort of fighters might suffice, but in others it might be necessary to put the enemy airfields out of action by low-flying attack and the use of delayed-action bombs. A recent example of the successful use of this method will readily come to mind.

Although this point must not be overlooked, it is unlikely that air opposition, unless it is strongly supported by "volunteers" from some great Power, would be difficult to deal with.

The Need for a Weapon

The fourth factor, the existence of a suitable weapon, is not only crucial, but at present seems to be lacking. It is not practicable to demand the evacuation of cities and towns and then attack them with atomic or even conventional H.E. bombs, or to use such weapons to enforce an air blockade. The whole trend of the development of air weapons for the last forty years has been to increase their capacity to cause death and material destruction. But there is no reason why we should not devote attention to the production of weapons which, without loss of life or serious damage to property, could bring sufficient pressure to bear against a nation to cause it to give way on the limited points at issue.

Sea blockade against nations susceptible to it, owing to their dependence on sea-borne trade or essential imports, used to have some of the qualities of such a weapon. On many occasions in the past, sea blockade or the threat of it has made a nation give in, sometimes before any fighting had begun.

We need weapons that would be effective against any type of country, from the primitive pastoral or agricultural community, to the well-organized industrial state. It is obvious that neither high-explosive nor the smallest and "cleanest" nuclear bombs are suitable for this purpose. But it surely is not beyond the resources of our scientists to devise such a weapon, if the requirements were clearly put to them. If we could impose at will a severe lethargy, an overpowering sleepiness, or inflict upon the population a mild, painless, but incapacitating malady or disability which had no harmful permanent effect, it would be quickly effective. It would not be long before the police forces and doctors were invited to enter the country and carry out their work of healing and restoration.



The difficulty, of course, is that most nations have signed a pact outlawing chemical and bacteriological methods of warfare. But now that the alternative methods have become so appallingly destructive, it is perhaps time to review our attitude towards such relatively humane methods of waging

war. It is indeed absurd that it is legitimate in war to kill an enemy, but not to anaesthetize him before doing so.

However that may be, it is certain that, in order to re-establish the rule of law, and raise the standards of international behaviour to their former levels, we need weapons less violent and unusable than modern bombs.

An Organization for Air Control

The final question, and perhaps in some ways the most difficult, is the nature of the organization that would direct the new system of air control. It could not be left to the United Nations, as at present constituted, for that would merely ensure that it would never be used at all, or only in a highly selective way which would, in practice, assist the spread of Communist domination. It would therefore have to be directed by some regional alliance or group, as allowed for in Article 52 of the United Nations Charter, which lays down that: "Nothing in the present Charter precludes the existence of regional arrangements or agencies for dealing with such matters relating to the maintenance of international peace and security as are appropriate for regional action, provided that such arrangements or agencies and their activities are consistent with the Purposes and Principles of the United Nations." As a start, the direction of regional air control could be vested in the Councils of the North Atlantic and South-East Asia Treaty Organizations.

Provided that the problem of a suitable weapon can be solved, there is no reason why such a system should not work, or why it should not check the spread of Communism and restore peace and order to many unsettled areas in the world to-day. It would, of course, be bitterly attacked by Communist propaganda, and stigmatized as the high-handed bullying of innocent sovereign states by Imperial Powers. For this reason, the Councils directing the system of air control would need to have at their disposal a much more comprehensive and efficient propaganda machine than the free world has yet regarded as necessary. It would be the task of this organization to expound to the world the motives and methods of the Communists, and the motives and methods of those who were resisting them, and to explain, in the clearest possible terms, the aims of each individual operation.

The Ultimate Cure

One final observation is needed. Under the system of air control of undeveloped countries, it was confirmed that the most lasting cure for disorders was the alleviation of economic distress, and the building of capital works, such as dams, irrigation canals, and factories to increase fertility and productivity, and railways and roads to facilitate the flow of trade and the exchange of commodities. In the same way, the most lasting cure for many of the world's disorders to-day is to convince people that they will improve their security and standards of living, not by embracing Communism or any other "ism," and certainly not by indulging in aggressive war, but by building capital works, improving production, expanding trade, and living in amity with their neighbours. In all this the great Powers can help enormously, as is already being done, by giving technical assistance and economic advice, and by providing money.

International co-operation and not cut-throat competition, friendship and mutual help and not hatred and envy, are the keys to world peace and prosperity.

"The great wars of history are the outcome, direct or indirect, of the unequal growth of nations, and that unequal growth is not wholly due to the greater genius and energy of some nations as compared with others; in large degree it is the uneven distribution of fertility and strategical opportunity upon the face of the globe."

SIR HALFORD MACKINDER

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In the Vanguard and Viscount, advantage will be taken of the superior operating qualities of turbo-prop aircraft over medium and short distances. The turbo-jet DC-8, with its higher speed, will realize its full potential on TCA's long distance routes.



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Yours sincerely,

J. Geoffrey Notman

Part II – Forum

$250 PRIZE ESSAY

Scientific Aspects of Military Management

C. M. MOONEY

Dr. C. M. Mooney, B.A., M.A., Ph.D., does research work in the field of perception at the Defence Research Medical Laboratories, Downsview, Ontario. His was considered the best entry in the Staff College Journal essay contest by the panel of judges, who were Air Commodore W. A. Orr; Mr. Pierre Berton, the Managing Editor of Maclean's; Wing Commander J. Gellner; and Professor J. I. Jackson.

IN DISCUSSING the scientific aspects of military management I have this kind of general proposition in mind: Management of any kind is a decision-making process. It specifies operational objectives and governs its enterprises in ways designed to realize these. It is impeded in this endeavour by both human and mechanical inertias and incompatibilities. It is competent and successful so far as it recognizes such impediments, discovers ways of reconciling human capacities and mechanical demands, and does not force this synthesis beyond tolerable evolutionary limits.

Therefore, my main contention will be that military management is most effective when it makes rational provision for the merger of two equally important kinds of factors that are functionally interdependent, although structurally incompatible at many points: *human* (relating to the individual man as a person, and to men as social beings within institutional groups and systems), and *mechanical* (relating to individual tools and machines and assemblies of these within operational systems).

Along the way, I shall undertake to describe and relate one to another the several scientific techniques that have proven to be useful adjuncts of commercial, industrial, and military management in reconciling divergent human and mechanical factors. In this, some illustrations and examples will not be amiss, and these may be conveniently set in the realm of Air Force management.

The concluding observations that I shall tentatively derive from the discussion will revolve around the peculiar difficulties attaching to military management, in both peacetime and wartime, and the most appropriate way of using scientific methods in resolving socio-technical problems.

The Interdependence of Human and Mechanical Factors

It seems worthwhile, in getting a grasp of our topic, to look at what might be called the "natural history" of organizational growth. Many enterprises originate and grow in a spontaneous fashion. They owe their birth to a person, event, or occasion by which there is revealed a particular social need. An appropriate enterprise is conceived which survives and grows depending on the legitimacy of the need. We have, for example, the Red Cross, Social Credit Party, Alcoholics Anonymous, the Olympic Games, and many others. These are usually voluntary in origin, prompted by considerations of health, recreation, aesthetics, morality. Others have arisen somewhat differently. There has been discovery of some novel sociological or technological device or process which is then put on trial to discover if a popular need for it can be created. This is typical of commercial enterprise. Business and industrial innovations of this kind have brought revolutionary social and cultural changes in their wake. The Singer sewing machine, Massey reaper, Bell telephone,

Ford car, are examples. Yet another way of introducing and maintaining social and technical change has been by rational decision or arbitrary *fiat* — commonplace in many realms of commercial, governmental, and military affairs. Here we have National Employment Service, Trans-Canada Airlines, and many diverse "schemes" like compulsory military service, prohibition, abolition of capital punishment, imposition of tariffs, and, of course, the host of directives promulgated by any administrative department. It will readily be noted that these diverse modes of evolutionary development can all be at work at one level and stage or another in the life of any established enterprise or institution.

But invariably, however initiated, the disturbance of an existing socio-technical equilibrium by the introduction of new social or technical arrangements creates repercussive forces and counter-forces. Attainment of the newly prescribed ends is attended by unexpected and unwanted consequences and side-effects. For every postulated operational "gain" through organizational or technological innovation many evolutionary "costs" have to be absorbed. So far as the changes are found tolerable, the various imbalancing and diverging forces that are set up become reconciled, easily or laboriously, rapidly or slowly, depending on the momentousness and magnitude of the institutional changes that are required, and on the size and complexity of the units that are affected. The compensatory changes occur in many ramified directions on a diminishing scale as the novel object or process becomes incorporated into a revised socio-technical context until finally a new operating equilibrium is attained. Two essential aspects of this adjustive process have to be observed. One is *sociological* — the drawing upon the ability of man to adapt himself and to be trained up to some psycho-physiological limit. The other is *technological* — simplifying and systematizing operational requirements. When the human and mechanical factors come within reach of each other a tolerably high level of over-all efficiency becomes possible.

The series of occurrences characteristic of this kind of "emergent" socio-technical evolution might be described as follows:

(a) A recognized need for, or a chance cue to, some novel social process or technical device;

(b) Development of a prototype of a social or mechanical instrument or system;

(c) Multiplication of necessary productive, maintenance, and operating personnel and facilities;

(d) Accumulation and codification of experience, knowledge, and skills;

(e) Adoption of increasingly extensive and rigorous performance criteria;

(f) Ramification and hierarchical structuring of the whole enterprise up to the best "pay off" size and degree of complexity;

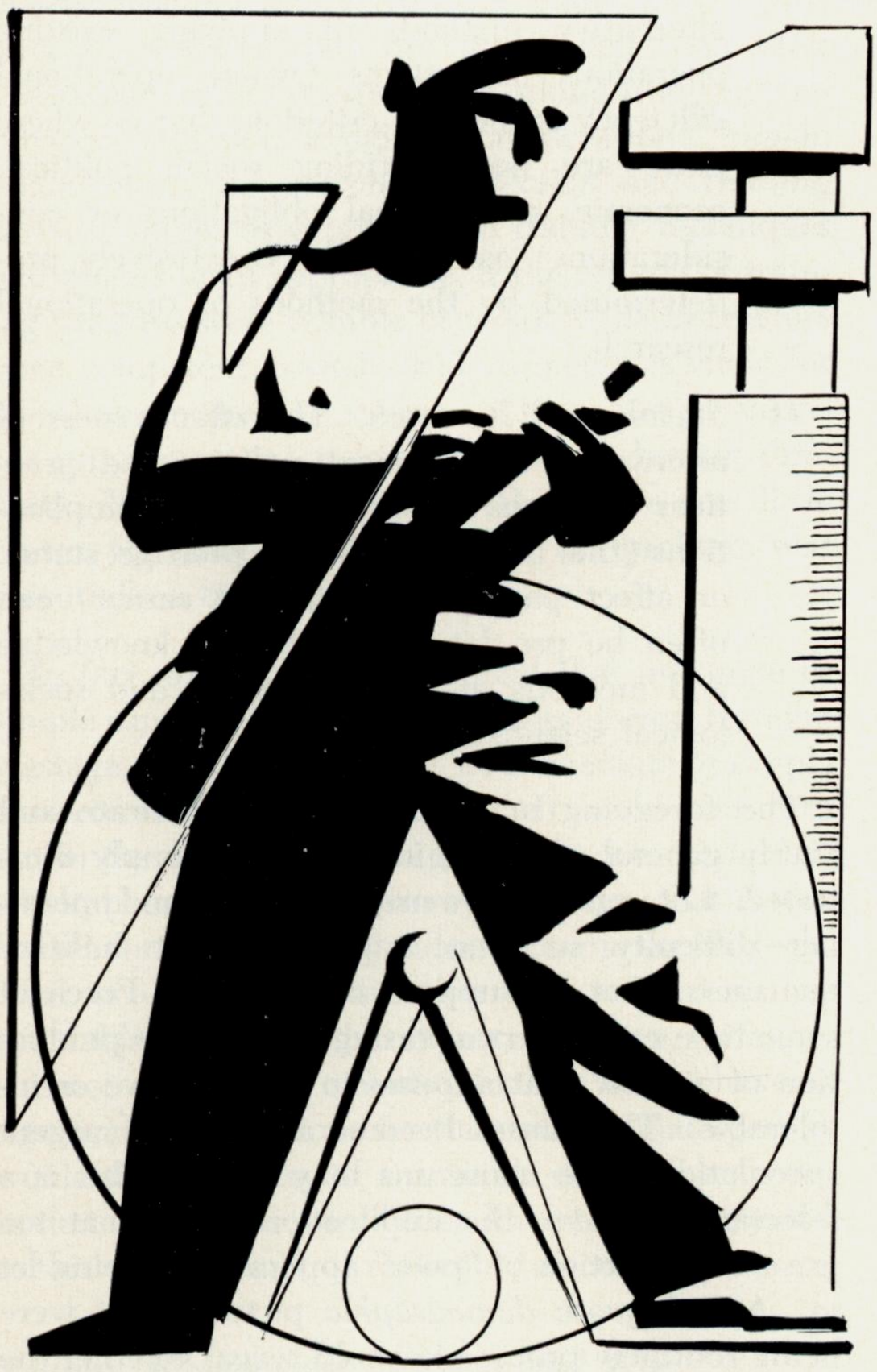
(g) Increased operational versatility and reliability through technological elaboration and simplification of the components of the whole system;

(h) Decreasing structural and functional corrections thereafter until a stable and tolerably efficient level of operational efficiency is found.

It is obvious that the attempt to master-mind and force through this kind of development in a prescribed time, or to short-cut or by-pass some of its stages, may be feasible but it will also be hazardous. It will be feasible so far as the people who will be affected are, or can be, motivated by a sense of "emergency" sufficient to enlist their cooperation. It will be hazardous for the reason that the implicit natural "governors" are supplanted by explicit operational specifications and objectives and the abrupt corrections that have to be imposed on these. In consequence, too great a strain on human adaptability and tolerance, or too great a taxing of technological knowledge and facilities may prove abortive. Insurance is lacking — in the natural or evolutionary sense — against unexpected lags, gaps, and impasses; not merely parts, but the whole planned enterprise may be seriously jeopardized.

Let us set aside, for the moment, the idea of the "emergent" nature of organizational development and perceive in another context, that of *efficiency*, how the human and the mechanical factors are inescapably bound up in each other. We can put forward the premise that the efficiency of a tool, machine, or system stems both from the aptness of its design and the competence of its human operators. From a mechanical point of view, the "instrument" must incorporate the operational specification (do what it is supposed to do) and must, at the same time, be convenient to produce from the engineering point of view; *but, with these criteria*

met, it does not thereby necessarily become an efficient "instrument". There is the further paramount matter of its utility. It must lend itself to human use; it must fit the normal man and fall in with his natural ways of perceiving things and doing things.



Thus, there would appear to be two complementary approaches to efficiency. One is oriented to the instrument and the operational system — the aim here is to ensure that the tool, machine, or system is designed to fit the natural capacities of the human operators. The other is oriented to the individual and the group, in which case the aim is to ensure that the human operators fit in with the working properties of the tool, machine, or system. There are practical limits to what can be accomplished on either side. The range and variability of human attributes preclude any exact tailoring of tools, machines, or systems to the capacities of the particular human operators involved. The definite physiological and psychological limits to human adaptability and trainability preclude any exact moulding of the human operators to the structures of the particular tools, machines, or systems.

Accordingly, at best, the practical pursuit of efficiency might be said to consist in carrying the design of tool, machine, or system to that point of standardization which generally fits the common human denominators; in simultaneously attempting to narrow the gap by finding those particular persons whose capacities come closest to those demanded by the working properties of the tool, machine, or system; and in winning and utilizing human cooperation and adaptability by competent training and management to ensure the most effective performance possible. We thus arrive at the simple idea that efficiency, in the prosecution of any planned enterprise, entails the securing of the means for endlessly *approximating to* efficiency — a process for the continuous reconciliation of human *and* mechanical demands at all levels from single elements to their complex groupings.

Application of Scientific Techniques to Military Management

Let me submit here that the crucial factors in the management process are the human ones, and that this is particularly so in the realm of military affairs. My grounds are not only the idea that technological evolution is essentially a social process but the further fact that in any assembly of particular components, the human ones are by far more variable and adaptable than the mechanical ones.

The human factors appear to fall into four main categories (although they are not independent, they represent four distinguishable areas): the demographic, the sociological, the psychological, and the psycho-physical.

An adequate *demographic* knowledge of human resources is fundamental to any mobilization and operational plan. Demographic data are more than census data. They are indices of the magnitude and utility of the manpower in a civic or military society. They are such indices as, for example, the nature and incidence of the existing physical, intellectual, domestic, economic, educational, skill capacities of the population. They indicate what is there — *the potential*, but they do not indicate how easily or how immediately that potential can be realized.

The question of what you can, with impunity, do to a society, or what you can get out of it, of gauging the unavoidable "costs" (in terms of time and

trouble in coping with human fears, anxieties, reluctances, and the like) that will be entailed in converting potential manpower into functioning manpower in pursuit of specific operational objectives, all this falls within the province of *sociological* knowledge.

Psycho-physical findings are facts about what the typical human being, as a physiological system, can do in a specified time under particular environmental circumstances. They indicate the limits of human capacity, in terms of seeing, hearing, moving, coordinating senses with muscles, sustaining physical "loads" of various kinds, and the like. Such findings are averages based on the measured performance of willing subjects doing the best they can.

Psychological factors, which are inextricably interwoven with the sociological, are those related to individual human characteristics, and the accommodation of these in organized social groups and operational systems. They have to do with distinctive differences in individual experience, interest, motivation, temperament, personality and intelligence, and with all motivating factors bearing on the usefulness of the individual.

Accordingly, we are in a position to describe and relate some of the major scientific procedures that have proven useful.

(a) *Demography.* Personnel and materiel plans and commitments can be made with good knowledge of human "resources", for this knowledge can be obtained through known demographic techniques of a sampling, statistical nature.

(b) *Personnel Selection and Training.* The selection assignment, training, and care of personnel can be facilitated by the application of practices known to doctors, educators, psychologists, and sociologists (intelligence testing, physical grading, vocational testing and appraisal, job classification, career planning).

(c) *Human Engineering.* The mechanical and functional efficiency of particular equipments (planes, tanks, ships, weapons, radar sets, knobs, dials, codes) can be markedly increased (beyond all other gains achievable by special selection and training) by designing the equipments in the first instance with a sure knowledge of the anatomy and perceptual endowments and limitations of the human animal, knowledge known to or attainable by anthropologists, physiologists, and psychologists.

(d) *Time and Motion Study.* The effectiveness of existing equipments and systems, however impaired in the first instance by initial faulty design, can be much improved by lay-out and work-methods techniques.

(e) *Operational Research.* The effectiveness of alternative operations or systems, or of alternative methods of applying existing operations or systems (where operational efficiency is the sole criterion, that is, where there are no overriding social, political, economic, or personal obligations or considerations) can often be conclusively predetermined by the methods of operational research.

(f) *Sociological Research.* The effectiveness of alternative management policies and practices which have political or social implications (that bear on traditions, prestige, status, or affect pay, promotion, and career) can often be pre-determined by the knowledge and methods of anthropological and sociological scientists.

The foregoing may seem overly elaborate and overly general. But the ideas can be simply illustrated. Let us consider a major planning and operating difficulty such as might confront military managers. Let us suppose that the Air Force at some time encounters a wastage rate in the production of aircrew that appears to be excessive or intolerable. The causes become a matter of urgent speculation. The consensus may be that this is a selection problem, the implication being that too great a proportion of "poor" applicants is being let in. An adequate *demographic* picture, if it were being routinely procured, would reveal whether the Air Force could, in fact, afford to turn down any more candidates than at present. A *sociological* inquiry might indicate if more or better prospective aircrew candidates could be encouraged to present themselves. Again, from the *human engineering* side, psycho-physical studies might be expected to show whether the aircraft were adequately designed to afford the maximum ease of operation compatible with their role. And the *personnel selection* service might ensure that the selection and training program was in line with the demands on the operator in the actual operational situation.

Any or all of these considerations might put the "bad selection" hypothesis out of court. It might then be surmised that the excessive wastage was a training problem. Routine *demographic* data, if

available, would at once reveal what categories and kinds of aircrew trainees were failing. How old are they? Where do they come from? Are they single or married? At what point do they fall by the wayside? Where do they go when they leave the Service? It might be determined on the sociological side how they see life in the Air Force, what they expect, whether they have been made afraid of the aircraft, whether they are dissatisfied with their status, pay, career prospects. Working from psychophysical and psychological considerations, *human engineering and personnel selection and training* services might ascertain if the training techniques and phases were appropriate, if the criteria of training progress were reliable or valid, if the instructors were competent as such, if allowance was made for slow learners and fast learners, if there was provision for supplementary assistance to those having difficulty. It might well turn out that there was little reason for assuming *a priori* that the problem was essentially a training problem.

In fact, it might well be found that no single or simple cause could be found for this aircrew training wastage, and that, therefore, no immediate or simple correctives could be prescribed. It could even turn out in the end, when enough was known about the whole phenomenon of aircrew wastage, that it was in fact for the present (and until some social, technical, or operational mutation occurred) at an unavoidable minimum; that it was, therefore, systemic, and not a "problem". Such a finding would have as significant implications for the military managers as would the discovery of any single correctible cause, in that their plans would then have to be contracted to this working unit of realizable aircrew.

Military Management in Peace and War

Military undertakings entail large, complex, highly specialized organizations and operations. The forces have a prescribed size, structure, weapons complement, and tactical doctrine. They have a sustaining history and sets of sentiments and traditions. They are internally honeycombed with informal structurings and practices born of the personal interests, ambitions, and inertias of their particular members – human "tolerances" and "intolerances" that make any organization operable, viable, rigid, or erratic. Thus, although they are monolithic, highly authoritarian and disciplined, and can incorporate changes more rapidly and correctly, perhaps, than most other organizations, there are limits on the degree and kind of changes which they can tolerate in any specified period of time. They are not free of the emergent evolutionary pressures and constraints that affect the operations of any human enterprise.

Nevertheless, a glance at the classic responsibilities of top military management reveals that military enterprises have to be planned and controlled in the highest degree. These responsibilities are, briefly:

(a) *Strategic appreciation* – appraising the politico-military situation and perceiving the probable operational contingencies;

(b) *Tactical conception* – conceiving the sizes and kinds of forces, equipments, and tactics deemed adequate to deal with the foreseen contingencies;

(c) *Operational implementation* – procuring, mounting, and committing the requisite forces and equipments in the most expeditious manner.

Unavoidably, the strategic appreciation is constantly changing and out-running the other phases. Thus, before the tactical conception is complete it may be partly invalidated by new factors in the strategic situation, with effects that go down to the operational level. As equilibrium is being attained at one level, changing factors at the other levels introduce obsolescence into current undertakings, demanding new equilibria along revised lines. Yet, despite their hypothetical and changing nature, military plans and operations have to be specific at all points and at all times, in the interests of operational versatility and control. In this task of regimentation the military management must always confront the potentially dangerous implications of attempts to compress an evolutionary series of events into an abnormally short period of time, and must undertake to ensure that in a given time its operational conceptions and commitments are commensurate with socio-technical capacity.

It is not surprising, therefore, that military managers tend to employ scientists and utilize scientific methods on a scale unmatched in other kinds of enterprise. Nor is it difficult to discern the kinds of scientific applications required in peacetime and wartime. The essential concern in peacetime is with preparation, training, battle plans, the development of new and improved logistical and tactical equipments and systems. These peacetime preparations have to be engineered in a rather hypothetical way in the light of uncertain future contingencies. There has to be insurance against the possibility of being committed to unworkable, irrelevant, or inferior

forces. Obviously those sciences should be used that ensure "ideal" structural design and functional utility, demographic, anthropomorphic, and psychological. The essential preoccupation in wartime is the conduct of battle and the most effective use of the limited forces that are operationally committed. The major concern is to ensure that the available human and mechanical complements are operationally exploited to the limit. The difference in scientific emphasis, as between peacetime and wartime, is that peacetime affords the opportunity to effect major technological and mechanical changes and improvements, while in wartime the major gains in the achievement of operational versatility and efficiency would be achieved by working with the more readily adaptable human components, and, in this, the premium would be on the application of sociological, psychological, and operational research methods.

Having described the principal scientific techniques available to management in reconciling divergent human and mechanical factors, and having looked at the socio-technical dimensions of military management in peacetime and wartime, we might now consider the most effective incorporation of those techniques into military management.

Many military research and development projects may be independently conducted either within the framework of the military services or outside. The appropriate scientists or technical officers can be directly assigned to particular service problems or specific military research and development installations can be separately created (such as are provided, for example, by the Defence Scientific Services of the Canadian Defence Research Board). Finally, problems or questions can be farmed out for solution by university or industrial research organizations.

To be considered carefully, however, is the danger that in segregated or compartmentalized research many of the results, excellent in themselves, may be operationally unrealistic. The best ration-pack or survival kit may affront the sensibilities of a whole ethnic group. The logically fair and proper trades-pay schedule may upset the non-commissioned rank structure. Ideal pilot selection criteria may fail to include not immediately relevant but ultimately essential factors bearing on officership. Thus, no one scientific procedure or service available to management can be the sole or even the major tool (as naive and enthusiastic proponents of one or the other of them sometimes claim to industrial or military clients). They are complementary, and each has its particular competence and place. They have to be used in conjunction, often all together, thus constituting a managerial "check" or "drill" to be gone through prior to any major organizational or operational change.

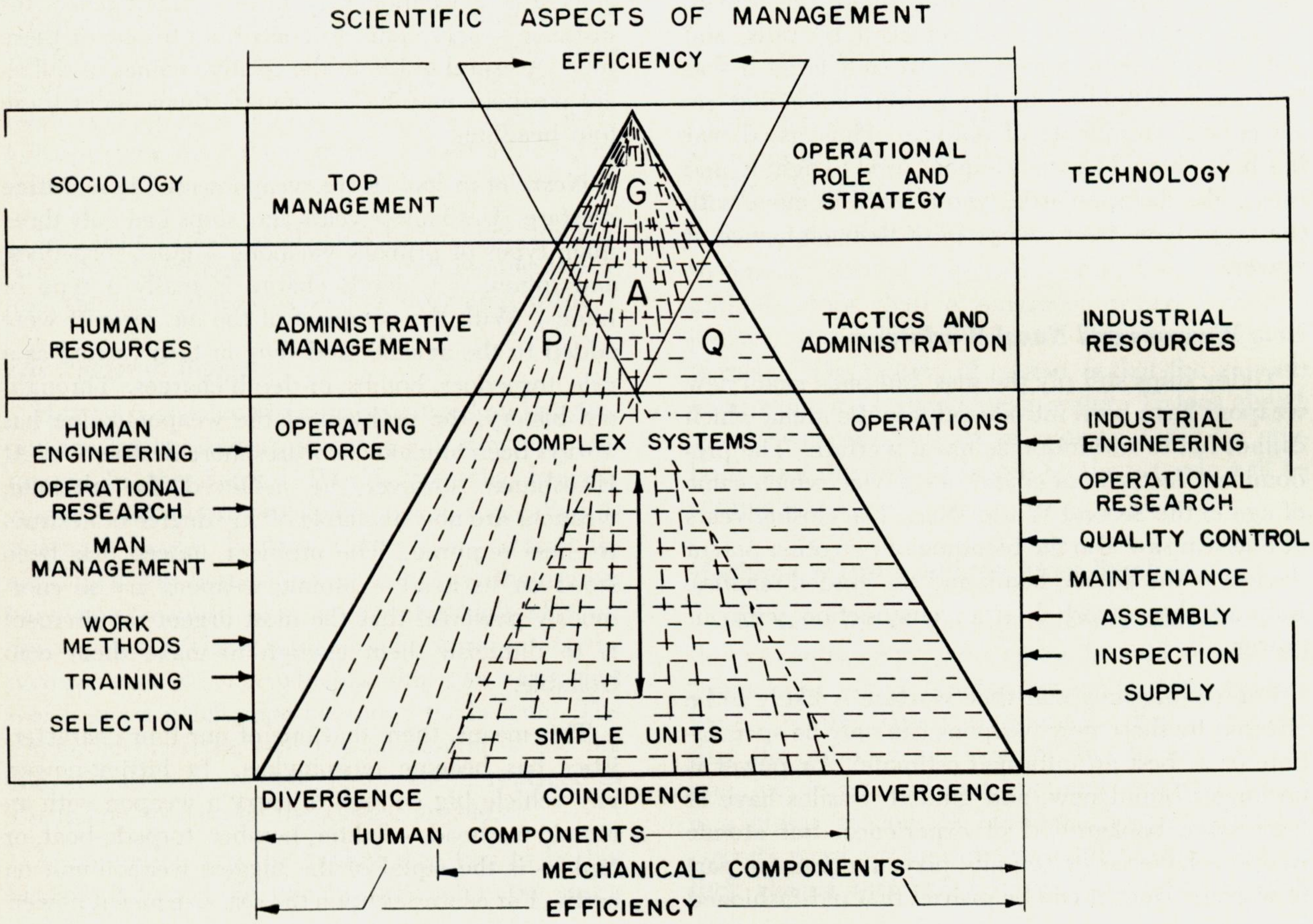
It must be realized, though, that scientific or technological units or services must always be ancillary and subordinate to management. Executive decisions have to be made in the light of many economic and political considerations. The commander or executive must always, in the last analysis, be guided by his own experience, knowledge, and intuitive "feel" for the forces and balances at play in the whole enterprise. Up to the point where overriding economic and political realities become paramount, the scientific findings can go a long way in eliminating areas of uncertainty by ascertaining the various "costs" that may be expected in realizing different "gains"; but the final decision must always come out of such wisdom as the executive has won in the course of his career and work. This is the ultimate "science" of management.

Summary

I have found it possible to summarize my argument in the diagram on the opposite page. This attempt may be only a pleasing conceit on my part, and I am well aware of the treacherousness of such over-simplified displays, but, however crude, it does wrap up what I have been trying to say. Upon even cursory study it will, I hope, explain itself. Some further study – conceiving the "vectors" to be moved in or out, up or down – may suggest many interesting morals to the imaginative reader, so I need not go into it further. It will be noted at once that I have not dwelt upon those scientific aids that are directly applicable to the "hardware" side of a managed enterprise. The omission is deliberate. While we automatically give much time and attention to the careful management of the machine, the plant, the operational system (presumably because they are so tangible and intractable) we tend to expect the man to "fall in" with the machines and somehow to take up the operational slack. In this we are being negligent on two scores: we fail to tailor the machine and the system to fit the man, in the first instance; and we fail, thereafter, to capitalize fully on human adaptability. Yet it is in the apt management of these factors that we may attain major operational "gains".

"To Edward Gibbon technological progress and moral growth were reciprocal developments. He could not foresee a time when man's scientific prowess would far outrun his political genius."

EUGENE M. EMME



Air Power, Sea Power, and Modern Weapons

SQUADRON LEADER N. EMMOTT

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AS LONG as men have sailed the seas, they have fought upon them. The form the fighting has taken has been determined by the weapons available at the time, and the fighting units have almost always been well-handled ships. It was not always so; for nearly two thousand years, from Carthaginian times to the Spanish Armada, the supreme instrument of naval power was not the ship nor even the ship's weapons, but the well-trained infantrymen who stormed over the bulwarks and captured an enemy vessel with small-arms alone. Indeed, if the Punic wars had been decided by naval skill, the Carthaginians should have won them.

Then, for more than three centuries after the Spanish galleons were scattered upon the Scottish and the Irish coasts, the gun ruled the waves. Galleys and oarsmen were replaced by sails, and sails gave place to steam, but by and large it was "villainous saltpetre" in the reeking tube that resolved the arguments of empire. Thus naval war has been shaped by the weapons used to fight it, and those, like the Spaniards, who refused to move with the times have been swept from their eminence of power.

New Weapons and Naval Warfare

Today ships still ply the seas, but once again new weapons have been introduced into the arena which cannot fail to revolutionize naval warfare. The predominant factor is, of course, air power, which came of age in the Second World War. The closing years of that war saw also the blooding of two other potent devices — the atomic bomb and the guided missiles. Both of these work best in conjunction with air power.

Forecasting how maritime warfare is likely to be affected by these new weapons can only be speculation, or at best an informed estimate. Air power is no longer brand new, and guided missiles have at least some background of experience, but atomic weapons have never actually played a decisive part in warfare, since it can be proved that old-fashioned weapons had thoroughly beaten Japan before the mushroom clouds made the Japanese skies completely dark. However, the past can teach us valuable lessons, even with regard to atom bombs. Let us, therefore, look backward so that we can look forward, and seek parallel situations in military history.

First of all, let us define what is meant by a weapon. A weapon itself, be it gun or spear or bow, must be carried and operated, and this needs men and sometimes a vehicle. The combination — crew, weapon, projectile, sighting equipment, vehicles, etc., — will be referred to as a weapon-unit. Weapon-units have only four characteristics: hitting-power, range, mobility, and protection. All the other characteristics a weapon may have — intelligence, for instance — serve only to contribute to one of these four. A useful guide to the relative values of different weapons may be to compare them under these four headings.

Next, let us look at the weapons used in maritime warfare. Until a few years ago, ships had only three main types of primary weapons — guns, torpedoes, and mines. (A depth charge is really a type of mine.) With the conquest of the air, aircraft were added to the arsenal, and they in turn carried as a rule, torpedoes, bombs, or depth charges. Throughout history, the problem of the weapon-maker has always been to make his wares more destructive. At Hiroshima, however, he achieved the ultimate; weapons are now available of any degree of destructiveness required. The problem, indeed, has been stood on its head — atomic weapons are so enormously powerful that the most urgent requirement is to diminish them enough to make them controllable.

This means, then, that one of our four characteristics has become meaningless. In hitting-power, any vehicle big enough to carry a weapon with an atomic warhead — fighter, bomber, torpedo-boat, or tank — is the equal of the biggest weapon-unit on earth. For centuries upon the sea, size meant power;

a 72-gun battleship could beat a 40-gun frigate, and a 16-inch gun dreadnought could sink an 8-inch cruiser. Likewise, a fighter-bomber posed little threat to a warship, because the bombs it carried were not powerful enough to sink the ship. Not so any more; just as the Colt .45 made all the cowboys of an equal height, all the weapons-units now are the same size.

Looking at another characteristic — protection — we arrive at the same conclusion by a different road, and find that all this has happened before. For 700 years the armoured knight ruled the battlefield because his coat of mail kept him secure from the swords and spears of the infantryman, and because the shock-power of man and horse could overwhelm the footman. Then a German monk (or was it Roger Bacon?) invented gunpowder; and the musket-bullet it propelled could pierce the horseman's armour. Because his armour no longer gave sure protection (indeed, it gave protection mainly against weapons the infantryman no longer relied on) it was not long before the horseman found it only an embarrassment, and he began to discard it piece by piece; reluctantly, perhaps, but inevitably.

It is interesting to note that the same evolution has taken place in the animal kingdom, in which the completely unarmoured mammals have thrived, while the enormous scaled and plated reptiles have been extinct for ages. The mammals' more efficient teeth and greater intelligence gave them more killing-power than the reptiles, whose armour, by restricting their mobility, became only a nuisance.

The same process is at work today upon the sea. Armour cannot protect a ship against atomic attack, and, therefore, it may as well be dispensed with.

The Factor of Range

Hitting-power having been equalized and protection having become irrelevant, let us now consider range. In the Second World War the heavily-gunned battleships practically never succeeded in sinking a carrier, because the carrier's aircraft far outranged the battleship's guns. Guns themselves have now reached very nearly the limit of their development. The guided missile here enters the picture, as a weapon which a ship can carry, but which has a much superior range to the gun. The conclusion must be that the naval gun — the big one, at least — is obsolete, and must be replaced as a seagoing weapon by the guided missile.

A generation ago the capital ship had to be big because it took a big ship to carry a big gun and a reasonable amount of armour at the same time. The big gun, however, is obsolete, and armour no longer matters. Only one conclusion follows — that the big ship is obsolete too. The corollary is, of course, that naval money is much better spent on little ships, and more of them, than on big ships whose strengths have been overtaken by events and rendered valueless.

The decline and fall of the big ship, indeed, began forty-five years ago, when, in the Fall of 1914, a German submarine sank three British cruisers, the Aboukir, Hogue and Cressy, in an afternoon. After that date — and particularly during the Second World War — the erstwhile behemoths of the sea were so pitifully vulnerable to submarines that they would hardly ever go to sea except with a prohibitively-costly escort of little ships. As a result, the 1939-45 war was fought by ships which were small enough to be risked.

The submarine encompassed the ruin of the battleship by depriving it of its invulnerability; but it must be stressed that its chief advantage — invisibility — is only a means to an end. A submarine, which is small — a few hundred tons — vulnerable even to the midget weapons of a corvette, and slow as warships go, yet carries within its slender hull the power to sink anything that floats. Its invisibility enables it to close the range enough to make its torpedoes count, and thus because it cancels out the longer range of the gun, effectively gives the submarine's weapons the equivalent of a longer range than those of the battleship.

It was thus the torpedo that made the submarine so deadly. Armed only with a gun, a submarine is nothing more than a nuisance; armed with torpedoes, it sends the biggest ships scuttling for harbour. The reason, of course, is that the gun lets in air while the torpedo lets in water. To look ahead, atomic weapons will let in enough water for anybody, and the process begun by the torpedo will be completed.

Maritime Warfare and the Atom Bomb

The atom bomb will also influence maritime warfare in another way. During the Second World War submarines were a greater menace to shipping than were aircraft. This was primarily due to the fact that the primary air weapon, the bomb, like the gun, lets in air, and that bombing a moving target is a highly inaccurate business. Torpedo-carrying aircraft were not as deadly as submarines because they alerted their prey before they dropped their

load, thus allowing him to take evasive action; because the aircraft could carry only one, or at most two, torpedoes, and thus could not fire salvos or patterns; and because their aiming, without benefit of the submarine's "fruit machine" computer, was not nearly as accurate. As a result, torpedo-bombers were as a rule used only over waters in which a submarine could not live, against ships which were too fast for a submarine to attack, or against targets which had no submarines in the vicinity. Their usefulness, of course, was restricted by their short range.

This situation has now been completely changed. The atom bomb, as was proved at Bikini, can let in enough water to sink anything; the inaccuracy of bomb-aiming has been countered by the greater lethal area of the atom bomb, and the development of homing weapons and air-to-surface missiles. Moreover, the enormous development of radar techniques has made concealment of any surface force impossible. In addition, aircraft are not nearly as expensive as submarines, and are far more versatile; they are more mobile and a dozen times as fast, and, therefore, are impossible for a ship to avoid; and they have the great advantage of taking far fewer highly skilled men into danger.

The last disadvantage of the aircraft, its restricted range, has vanished with the advent of inflight refueling. Aircraft have proven they can fly nonstop around the world. The last refuge of ships against aircraft – to flee to remote waters – has vanished.

Aircraft have at least two other advantages over ships also – they can hide, and they can dodge. Aircraft flying at 500 feet above the surface are below the radar horizon of ships 25 miles away, and if the aircraft reduces height to 250 feet this distance shrinks to 18 miles. An aircraft stalking a ship then is in the position of an Indian scout hanging on the flanks of a column of infantry marching in a cleared space in a forest, able to attack at will and retire to safety immediately afterwards. This is exactly the advantage the Mongol horsemen of Genghis Khan had over the ponderous cavalry they fought, the horse-archers of Belisarius in 500 A.D. had over the Gothic infantry, and the German tank-columns of 1940 had over the immobile Frenchmen – complete possession of the initiative, with all its physical and psychological benefits.

In the Second World War, sinking a ship with a bomb was extremely difficult, because the ship could often simply see the bomb coming and dodge. Today, a ship which has two minutes' warning of the approach of a bomb (and this is a period it cannot hope to have) can move only a mile or so in that time. As was proved at Bikini, an atom bomb a mile away can cripple a warship, and the ship therefore has no chance of avoiding even ordinary free-falling bombs, let alone guided bombs or missiles. An aircraft, on the other hand, because it can travel a dozen times as fast as a ship, can move anywhere up to 12 miles in the same two minutes, (not to mention its capability of moving in 3 dimensions) and this should be enough to take it out of danger. Since its speed is so much higher, the aircraft can dodge while the ship cannot.

All these arguments apply with redoubled force to the carrier. A carrier is a ship whose weapons are its aircraft, and thus when one of these vessels is attacked by land-based aircraft the struggle should be considered not as a ship against an aircraft, but as a ship against a land airfield. It is by now a truism that the land airfield's weapons – its aircraft – have more speed, range and hitting power. All during the Second World War, as long as the opposing sides were reasonably equal, carriers were never able to operate within range of land-based air; their only chance for survival was to stay out of range, and this margin of protection no longer exists with the ever-lengthening radius of action of aircraft. In a fight between two weapon-units, the one with the better weapons wins; and there is no doubt that the land airfields will always hit harder and reach farther than the carrier. The conclusion is obvious; the carrier is obsolete.

If carriers, which are warships, are no longer capable of defending themselves, consider how vulnerable the big troopships – the "monsters" of the Second World War – have become. The Queen

Mary, laden with a division of troops, cannot possibly escape aerial reconnaissance, and once located such a ship will justify an all-out attack. In future the big liners will be able to operate only under conditions of total air supremacy, which is highly unlikely to be gained early in a war; furthermore, they will offer the most tempting of targets, since the destruction of a whole division occurs only in the most complete land victories. The first signpost on this historical road can be found in the sinking by German air attack of the "Empress of Britain", using conventional TNT bombs. Against atomic air attack, the "monsters" will be sitting ducks.

Convoys

Convoys, even more than monsters, should fall easy prey to air attack. The forming up of merchant ships into convoys has been necessary because they have negligible fighting value in themselves, and must be concentrated to economize on escort vessels. At the same time, however, even the closest convoy must still have a certain amount of dispersion. Dispersion is a mathematical kind of protection; the fact that one's units are fatally vulnerable to a well-directed blow is accepted, and they are simply spread over a bigger area, the lethal radius of the weapon used being the determining factor in the amount of dispersal required. Throughout history, improvements in missile weapons have always been countered by increased dispersion, as Napoleon recognized when he said that the pike demanded close formations, while the musket required extended lines, and as is testified to by the loose orders in which modern armies operate as compared to the well-drilled columns of a century ago. With the nuclear lethal radius of a mile or more, a convoy becomes so spread out that it scarcely is a convoy at all.

The value of convoys has therefore been reduced enough to make their retention questionable The usual merchant-ship, however, as was abundantly proved in the Second World War, is so vulnerable as it plods across the ocean that to send it unescorted to sea is practically to condemn it to death. In the war in the Pacific, for example, Japan was so completely strangled by attacks on its merchant navy that in 1945 it could not supply its armed forces even if the civilians starved. Under atomic attack it is likely that most of the world's merchant shipping will be indefensible and hence useless.

It can be seen then, that the primary anti-shipping weapon in a future war will be the aircraft, not the submarine. Convoys and major surface units will find all the waters of the earth as untenable as they found the Mediterranean in 1941, when air warfare was still adolescent and atomic weapons still a dream.

This does not mean, however, that the submarine is no longer a threat to surface craft. It still is; but the aircraft is a far more potent threat. Given the choice of spending its anti-shipping money on submarines or aircraft, a nation will draw far greater dividends from an investment in air strength. It is noteworthy here that the aircraft should always be a deadly threat to the submarine, since the submarine cannot hope to let water into an aircraft, while to attack the aircraft it must give up the only advantage it has over the surface ship — its invisibility.

To sum up, let us compare a ship and an aircraft as weapon-units. Protection and hitting-power having been cancelled out, only range and mobility are left. The aircraft is far more mobile than the ship, and the range of its weapons should be at least as great, presuming both ship and plane are equipped with guided missiles, since the aircraft can exchange its height for missile-range. The aircraft will also have the priceless advantage of the initiative. Aircraft, despite their present-day costliness, are still a great deal cheaper than ships, and thus should be available in greater numbers. This disparity, furthermore, should increase, because the rate of development of aircraft proves they are easier to replace with newer, more effective models; cruisers did 25 knots in 1907, while today, in a pinch, they may do 35, over a half-century in which aircraft have changed out of all recognition. In a ship-aircraft combat, therefore, the aircraft has every advantage, and should win the great majority of the encounters.

Air Power and Sea Control

All these facts, all these changed conditions, point out one inescapable conclusion. In a future maritime war, command of the sea will be firmly in the hands of those with superior air power. After so many centuries of rule, the fighting ship has become an anachronism in its own element, completely at the mercy of the fighting aeroplane.

A drastic, irresponsible statement? Perhaps, but *all* this has happened before. The Roman legions, which gained their power from their splendid infantry, conquered the Western World. Then, about 600 A.D., some unsung genius invented as simple a thing as the stirrup, and gave cavalrymen more hitting-power than the foot-soldier. As a result, the mailed horseman ruled the battlefield for 700 years. He was supreme for so long that it seemed impossible he would ever be dethroned; but the longbow and then the musket made him only an auxiliary, and the repeating rifle drove him off the battlefield completely. Horsemen and warships are both now obsolete as primary fighting units, and for the same reason — they are too vulnerable for what they cost and what they can do.

When we consider the effect on warfare and the world of the fact that sea-power is now firmly in airmen's hands, let us think how potent sea-power really is. It is vital only to countries, usually insular or peninsular, whose survival or prosperity depends upon the sea. As a rule, however, no country is defeated by sea-power alone; the historical role of sea-power has been to set the stage for land or air forces to act. Often the naval task has simply been to prevent defeat, as Nelson's navy did when Napoleon's army was poised at Boulogne in 1805. Sea-power has always accomplished this by keeping the seas open for one's own traffic, while denying them — if possible, but not necessarily — to the enemy. Naval strength, however vital to island powers, is often unimportant to continental countries, who can rise to immense heights without taking to the sea at all. Tamerlane scarcely saw a ship, and Napoleon was not sent to St. Helena until the Allied armies beat him at Waterloo.

On the other hand, once an island country loses its power to use the sea, its fall is quick and calamitous. In the past, the disease produced the cure, since those who had to use the seas to survive became such skilful sailors that they ruled the waves. In the Napoleonic era, for instance, the French ships were actually better-built than the British, but the British skill gained over years at sea always tipped the scale of battle.



Today, with the aircraft the dominant maritime weapon, the sailor's knowledge of his trade, gained through years of merchant service and in warships, is no longer the priceless asset it was a generation ago. The day-to-day life of landsmen who make frequent use of the air gives them air experience which is easy to turn to maritime purposes, as the landlubber Luftwaffe proved in 1942 when it denied the Mediterranean to the battle-tested and efficient Royal Navy. Thus a land-power with an effective air arm may well be able to deny the use of the sea to an insular enemy and strangle it, while at the same time the island's denial of the sea to the land power's limited shipping will be only an embarrassment. Air power and the atom bomb have thus minimized the peculiar strengths of island power, while magnifying their vulnerabilities. The situation is scarcely novel. In the days when naval battles were decided by hand-to-hand fighting, the navies with the best swordsmen won, be they ever so

unused to the sea. The Romans made the Mediterranean "Mare Nostrum", despite the fact that the Latin word for "navy" is derived from the word for "sick". Likewise, the very Spaniards, who had met disaster with the Armada in 1588, had won a smashing victory over the Portuguese at Terceira in 1582 because their infantry were better. Today, the seas can be controlled by airmen, who, even if they cannot use it themselves, can deny it to their enemies. Seamanship alone will in future be of little more use than it was to the Carthaginian sailors, who could never support Hannibal's troops, and lost their war.

History has many examples of the changing impact of national skills on warfare. In medieval times, when the horseman ruled the battlefield, countries like Poland or Hungary whose broad acres encouraged horsemanship were automatically great powers. The best examples are the Mongol hordes of Genghis Khan, composed exclusively of cavalry, who never lost a battle and left 25,000,000 corpses in their wake. When cavalry was made obsolete by missile weapons these horse-loving countries fell immediately to third-class rank, becoming the victims of lands who had good infantry, as Poland fell to Austria and Prussia, Hungary fell to Austria, and the homelands of the Mongols were gathered into the Czarist fold.

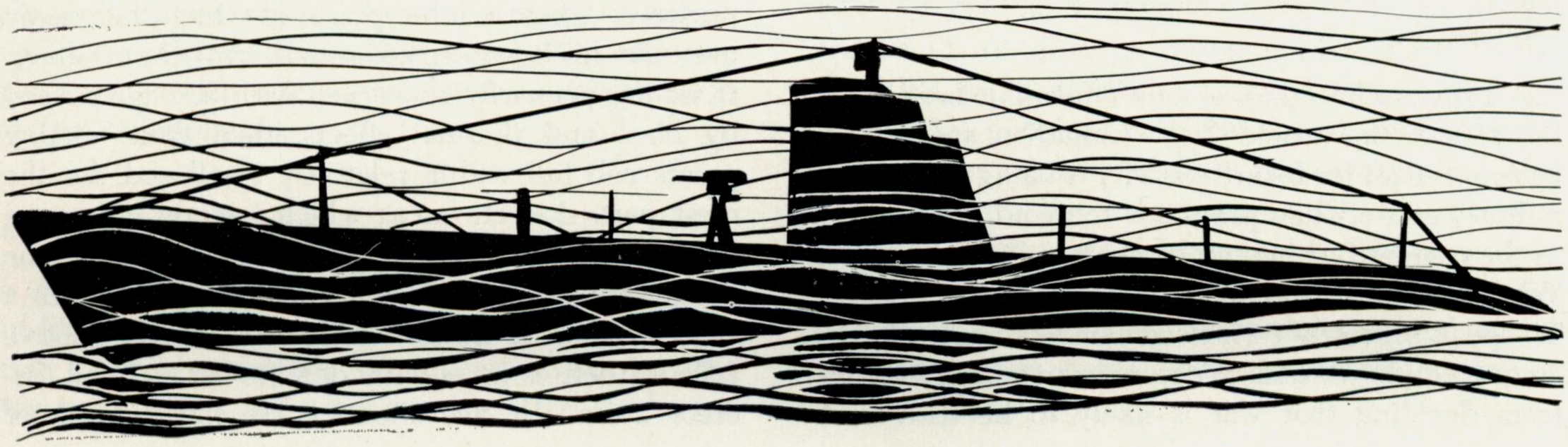
Venice fell from its pre-eminent position when guns grew too large to be carried in galleys, and Holland ceased being a world power when sailing ships grew too big to sail up the narrow Dutch creeks. Spain declined when artillery came into prominence and eclipsed its matchless infantry. History has now overtaken the island powers also, and the pattern of power which has been so familiar since the end of the Napoleonic wars is due for profound changes.

Sea Power and the Shape of Wars

These changes should have far-reaching repercussions not only on how we use the sea, but also on how we fight our wars. Such armadas as that which carried the Normandy invasion forces will be fatally vulnerable, and the supplying of a beachhead will be immensely difficult. The value of maintaining a continental foothold, therefore, will be greatly enhanced, since an invasion across the beaches will be so much more difficult. Furthermore, the difficulty of supplying forces overseas will require the most rigid economy in men and material; the days of drowning the enemy in a flood of troops and supplies are over. Once again, air power can play a wider part here, by providing "artillery" support by means of air strikes by home-based aircraft. In passing, it is worth noting that these conditions greatly favour a highly-trained, well-disciplined professional army, rather than a mass of conscripts.

Again, weapons of increased hitting-power have traditionally favoured the offensive, as has been witnessed by Alexander the Great and his phalanx, by Genghis Khan and his horse-archers, and the German panzer columns and their tanks. Purely defensive sea-fighting, which took up so much Allied effort in the Second World War, will in future be all but useless. The best answer will be to attack the enemy continuously, going ever farther afield. Ships are too vulnerable, too immobile, and too restricted in their sphere of operations to carry out this task. The job can be done only by aircraft.

All these facts point inexorably to one conclusion — that the hegemony of the sea is in the hands of aircraft, and that naval craft will never again be anything more than auxiliaries. The revolution in weapons requires a new look at maritime strategy, whereby our resources are concentrated where they will pay the highest dividends — in the air. If we recognize this fact and plan for it, the future will see our defence money well spent; and if we do not, we will find our weapons as useless in our hands as the broadswords of the belted knights were at Agincourt.



The Design of Active Air Defence Systems

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IT IS my purpose to put forth for consideration some tentative general principles for designing active air defence systems. By active air defence I mean a systematic organization of military units, the purpose of which is to destroy enemy airborne vehicles at some point after they are launched but before they reach their assigned targets. An active air defence system is only a part of a nation's total plan for insuring the security and prosperity of its people in a basically insecure world of limited resources.

Before discussing these proposed air defence principles it is wise to examine briefly the only picture which has received more public acclaim than the Mona Lisa. This is the oft-mentioned "big picture". It is because air defence at present takes up only a corner of this large canvas that it is important to make sure that we understand the idea behind the whole design. The design of the air defence corner must fit the rest of the picture. If it does not, the artists responsible for this corner will likely only be given enough paint to barely cover the canvas.

In both the Canadian and U.S. designs for future security and prosperity, it has been necessary to devote an uncomfortably large segment to accommodate the spectre of war. The reason for this was concisely described in an article by Group Captain M. Lipton in the 1956 issue of this Journal: namely, the nation which appears to be our most likely enemy is obviously building a strong military machine.

A considerable part of our (meaning here as in the rest of the article "both Canadian and U.S.") national effort for future security is being devoted to military and civilian programs to avoid this war, or as the current fashion in phrases is – "to deter war". What is a logical way to go about "deterring a war?" To speak precisely (which generally requires being long-winded) we wish to deter our potential enemies from deciding that war is likely to be their best choice among the alternative courses of action open to them at any moment. This affords us two ways in which to work; we can endeavor to make as unattractive as possible the probable results of selecting the alternative of war, and we can try to increase the attractiveness of the other alternatives.

This, then, constitutes the "big picture". The central theme is continued security and prosperity, but in this paper I am concerned only with ways of making war unattractive to the enemy. In truth, even this part is too big for detailed consideration. We want to get down to the problem of how to deter the enemy from attempting an attack with airborne vehicles carrying atomic armament. Two actions are required. In chronological order, rather than order of importance, we must first limit the damage caused by the enemy's initial strike to as little as possible and second, be able to launch a retaliatory strike which will greatly damage the enemy. Which of these will produce the more deterrent effect per dollar invested is a source of never-ending argument and cannot be discussed here.

The problem of how to put a limit on the damage to our countries by destroying enemy bombers will be the sole concern of the rest of the article.

Targets and Values

To solve this problem it is necessary to define the target system which contains the things we want to preserve. These are the places at which the enemy must aim his bombs in order to destroy these values. If we are primarily concerned with damage caused by blast and thermal effects, then these aiming points will fall within relatively small and, for the most part, discrete areas which include cities and military installations. If we were to assume the enemy might select aiming points primarily with a view to causing maximum damage by radioactive fallout, there is no equally definite list of small discrete areas. In this situation we might think of

contour lines drawn on the map so that a bomb dropped anywhere on a contour line would do equal damage by fallout. For this sort of a continuous distribution of aiming points we have no specific principles for designing the defence system. Although it seems likely that the principles to be explained in this article may apply, a full discussion of the problem is a study in itself.

We need some way of expressing quantitatively the damage done when a bomb hits one of the aiming points. Clearly, the damage done by the explosion of a large yield weapon on some urban center would be very difficult to measure even after the fact. Fortunately, the solution of our problem does not require that we be able to express the damage in absolute terms. It is enough if the damage can be measured relatively; thus all we need to know is the relative values of the various targets. If we can say that the destruction of target A does twice as much damage as the destruction of target B, our measuring scheme will be adequate. The most convenient measure of the relative worth of a target is its population, for in general other elements of value are closely associated with population; large population usually means a large amount of industry, transportation facilities, and other economic activity.

One element which it is very important to protect and which is often not close to centres of population is the retaliatory bomber force and other key military installations. To fix the value of these military targets in proper relation to targets measured solely by population is not easy. A number of things must be taken into account; the vulnerability of such military targets, the effect of warning, and the strength of the enemy's defences, to name a few. The question of the relative worth of urban centers and military installations is closely linked to the relative deterrent value of being able to limit damage to cities or being able to strike a blow in retaliation. Because the rest of this article does not depend on the answer to this question we shall avoid this issue. We must assume that we have somehow by compromise and cajolery arrived at a list of targets and their relative values. For simplicity's sake, we shall assume that target value has been measured in terms of population.

Damage to be Tolerated

At this point we must face up to a hard, cold fact of life in the atomic age: it is not economically feasible to build a defence system which can prevent the enemy from doing any damage at all. In fact, it is not feasible to prevent the enemy from having a very high probability of bombing any target he selects. What the defence can do, however, is to control the number of bombers the enemy must assign to a particular target if he wishes to have that very high probability of bombing the target.

This amounts to setting a price on each target. The price is the number of bombers which the enemy must assign in order to have a high probability of bombing the target. The defence can set this price by fixing the number of defence weapons he forces the enemy to encounter before reaching the target. The price which the defence sets for a given target must be in proper proportion to its value. Thus, by setting a price for each target the defence can exercise a degree of control over the total damage the enemy can do. The enemy has only a certain number of bombers to "pay" for the targets and with this total resource he can only "afford" to do a certain amount of damage. One of the basic problems in designing an air defence system is to find out what are the best prices for the defence to charge.

Pricing the Targets

The objective of the defence should be to set the prices so that, for the number of defence installations deployed, the total damage which the enemy can do with a given number of bombers is the least possible. Said another way, the defence wants to minimize the number of weapon installations needed to limit the total damage to some specified amount.

The problem of finding the right price to charge the enemy for each target can be considered as a formal problem in game theory. Each side has a number of strategies available to it. The defence strategies consist of all the ways in which a given number of weapons could be deployed, and for convenience it must be assumed that each weapon can engage only the bombers assigned to a single specified target. The strategies available to the enemy consist of all possible different allocations of the available bombers to the targets. Another important assumption in the game is that the enemy knows the weapon deployment used by the defence and also can estimate the effectiveness of the defence weapons with reasonable accuracy. The pay-off in the game is the total expected damage done to the targets of the defence, which we have agreed should be measured in terms of the expected number of people killed.

That word "expected" which appeared in each of the last two sentences is important and requires explanation. The concept of expected value can be explained by recourse to a rigorous mathematical definition, but an illustration is probably simpler. Actually we are dealing with a probabilistic phenomenon. When a number of bombers is assigned to attack a target and a number of defence weapons engages the bombers, it is usually possible to estimate the probability that one or more of the bombers will survive the air battle and succeed in bombing the target. It is not possible to say with certainty that the target will or will not be bombed, any more than it is possible to predict that an honest coin will certainly fall "heads" on one particular toss. But it is possible to estimate that the probability of a "head" is .5. Also, it is reasonable to "expect" five "heads" out of ten tosses. Actually, in any one set of ten tosses it would be possible to observe anything from no heads at all to ten heads. If we repeated the experiment a large number of times, we would *expect* to find an average of five heads per ten tosses. This is the *expected* number of heads.

One of the characteristics of a game theory solution of the offence-defence game is that the enemy must pay the price set by the defence if he wants to get the most damage for the number of bombers in the entire attack. If the number of bombers assigned to each target were less than the price set by the defence, more targets could be attacked but the total expected damage would be reduced. The defence does not achieve its objective by completely preventing the bombing of any target because the enemy has only to send enough bombers to have a very high probability of bombing the target. The defence can achieve its objective by setting the prices in such relation to target value that the total amount of damage the enemy can do is not only limited, but minimized.

The situation of greatest interest to us here can be described as one in which there is a long list of targets of unequal values and it is desired to restrict the destruction of the targets to less than 30% of the total value. Although up to this date no proven solution to this game theory problem has been found, one is known which is believed to be relatively good. The outstanding characteristic of this solution is that the defences must be deployed so that the expected damage at a given target divided by the number of bombers set as the price is equal at all targets.

Again, rather than try to explain this idea by delving into the mathematics of the business, recourse will be had to an illustration. A store packages potatoes in bags of assorted sizes and then fixes the price on each bag on the basis of weight so that the store receives the same price per pound for each of the bags. There is one difference between this illustration and the problem we are actually interested in. In the case of the potatoes there is no element of probability present. If the purchaser comes through with the price set for a particular bag, he gets the bag for a certainty. In the bombing problem, even though the enemy pays the price set by the defence for the target there is some probability, usually quite small, that he will not succeed in getting a bomb on the target. This is why the pricing rule is to make the *expected* number of deaths per bomber equal at all targets. That word *expected* takes care of the probabilistic aspects of the problem. If it were not for them, the prices would be directly proportional to the population of the target, just as with the potatoes, the price of a ten-pound bag would be double the price of a five-pound bag. A reasonably good approximation which takes account of the probabilistic aspects is to set the prices in proportion to the 1.25 power of the value of the target rather than proportional to the first power of the value. Actually, it appears that among several suggested solutions the differences in the effectiveness achieved by the defence are quite small. If account is taken of the fact that the true relative values of the targets cannot be established with any great degree of precision, setting the prices in direct proportion to the estimated target values seems a good enough procedure to follow in actual practice. For analytic studies having pretensions, sometimes not justified, of high precision, something more mathematically elegant should be attempted.

Having determined a reasonable rule for setting the target prices, the next problem is to find a way for the defence to extract the desired price from the enemy.

Collecting the Prices

The defence tries to force the enemy to pay the price set for each target by engaging the bombers with the defence weapons. The problem is to determine how many defence weapons are required to extract a given price in bombers. Clearly the number of defence weapons needed will depend on a fairly large number of factors. Some of these are quite obvious; for example, the probability that the weapon will be successful in engaging the enemy

and the probability that it will kill the bomber given that it has reached the general area of engagement. These factors must all be carefully defined and the definitions will vary somewhat from one type of weapon to another. One very important factor which is sometimes overlooked is the type of fire coordination. Here the term "fire coordination" is used to mean the manner in which the defence weapons are assigned or divided among the bombers. This becomes a problem whenever more than one defence weapon engages a group of bombers more or less simultaneously. There are a number of ways in which this assignment can be made. One of the easiest to describe and visualize is for the defence weapons to be divided evenly or uniformly over the number of bombers in the group. For example, assume ten interceptors are attacking a group of five bombers. It might be that the interceptors could form pairs and each pair would direct its fire against a single bomber. This has often been described as uniform weapon assignment. Usually implicit in a model of uniform assignment is the assumption that a defence weapon once assigned to a bomber cannot be diverted to another bomber in case the one to which it was originally assigned has been killed.

A less effective method of assignment which is very frequently assumed is random coordination. In this model a given defence weapon has an equal chance of being assigned to any one of the bombers available for attack and the assignment of one weapon is made without reference to the assignment of the others. The result is that quite large variations in the number of weapons assigned to each bomber are apt to occur. Some bombers may escape without even a single weapon being assigned against them, while others may have considerably more than necessary. Such a state of confusion in regard to the coordination of fire results in the requirement for a much greater number of defence weapons in order to extract a specified bomber price than would be the case with uniform coordination.

From the standpoint of the defence the most effective method of fire coordination is what has sometimes been called perfect coordination, or perhaps more graphically the shoot-look-shoot system. This simply means that a weapon is never assigned to a bomber until a determination has been made that the bomber has survived the attack of any previously assigned weapons. While this is the best possible way to coordinate weapon assignment, the time required for assessing the result of each weapon assigned often reduces to an unacceptable degree the rate of fire.

Each of these three degrees of fire coordination leads to a different number of defence weapons being needed to charge a specified price in bombers, and in each case the solution can be arrived at by relatively simple pencil and paper computations. These three types of coordination do not exhaust the possibilities although they do pretty well span the range. A number of much more elaborate models of fire coordination have been developed using the three described as the basic building blocks.

One of the more realistic ways to solve the fire coordination problem is to develop actual firing doctrines or standing operating procedures rather than to assume some degree of fire coordination. The difficulty with this approach is in the computation of the results. For a number of interesting looking doctrines, attempts to estimate results by analytic procedures have not been too successful. The best way seems to be to use a large electronic computer to simulate the assignment and firing process. This has been done for several doctrines of fire applicable to surface-to-air missile systems. The results of these studies can be used to determine the number of missile units which the defence must deploy in order to charge the enemy some specified price for a given target.

Weapon Deployment

A second problem in determining how the defence can force the enemy to pay the desired price is the deployment of the weapons. Where should the weapon bases be located?

To solve this problem it is necessary to take into account the fire-power limitation of different weapon systems. By fire-power is meant the number of shots or weapons that can be brought into contact with the raid during some unit of time.

Some weapon systems, notably some which employ short-range surface-to-air missiles, have their fire-power limited because of the rate at which a defence unit can pump out shots. These may be termed rate-of-fire limited systems. A system using interceptors is more apt to have its fire-power limited because only a certain number of interceptors can engage the same group of bombers simultaneously, and a period of time is necessary for them to complete their combat. This may be called a rate-of-intercept limited system. A third class of weapon would be one with an unlimited fire-power; in the extreme there is no such weapon, but it seems possible that some systems might reach such high fire-power rates as to be considered as unlimited for practical purposes.

The problem of deployment is different for each of the three classes of systems. The simplest case is the rate-of-fire limited system which achieves its maximum effectiveness when its weapon units are deployed surrounding or in close proximity to individual targets. Each unit is considered as deployed for the defence of one particular target, and the possibly small effectiveness of such units shooting at bombers passing through the outer edges of the weapon's range on the way to attack another target is neglected.

For the unlimited fire-power system a rather elegant model for deployment has been developed involving the solution of a linear programming problem. However, since such a system is not available, further discussion of the deployment model is not warranted even though it is intriguing from an analysis point of view.

A theory for the deployment of rate-of-intercept limited weapons presents some difficulties which are currently under study. The best thing seems to be to deploy them in a uniformly spaced pattern over the area which contains the targets. The spacing between bases will depend on the rate-of-intercept. It would seem logical to limit the number of bases to that required to maintain the maximum rate-of-intercept against the bomber stream as it progresses. To deploy bases more densely would simply mean that even though a raid came within range of a base it might not be able to fire because other nearby bases might already be launching missiles at a rate equal to the rate at which they could be brought into contact with the raid.

Next, there is the problem of how to deploy a mixture of weapon systems. This is the real problem because defence systems must almost inevitably contain several types of weapons. A study for the purpose of finding some principles applicable to this problem is currently in progress, and while it appears that some principles can be developed, it seems likely that their application to real problems will have to be somewhat approximate.

Summary

There are certain general principles which can be applied to the problem of designing an active air defence system. If these are followed, the resulting air defence system should be an efficient one in the sense that it will provide the most protection in return for the resources used in its establishment and operation.

The technical difficulty and the cost of building an active air defence system to protect the North American continent against an attack with atomic weapons are both very great; therefore it is of utmost importance that plans for such systems should be based on the best available principles. It is believed, but remains to be proved, that an integrated Canadian-U.S. system can be built to a degree of effectiveness which will cause the enemy to ponder long before he decides to attack and will deny him a major share of his objective if he does attack.

"The militarist is so confident of his own ability to look after himself in that social – or anti-social – system in which all disputes are settled *manu militari*, and not by process of law or conciliation, that he throws his sword into the scales when the issue between a regime of violence and a regime of organized peace is trembling in the balance. The sword's weight duly tips the balance in favour of the continuance of the old barbaric dispensation; and the militarist, exultant at having once more made his will prevail, now points to this latest triumph as a final proof that the sword is omnipotent. In the next chapter of the story, however, it turns out that he has failed to prove his thesis *ad hominem* in the particular case which exclusively interests him; for the next event is his own overthrow by a stronger militarist than himself."

ARNOLD J. TOYNBEE

Professional Education for the R.C.A.F.

J. I. JACKSON

WE CAN SAY that the modern officer needs to have three qualifications: good personality and character, skill in his basic trade, and professional knowledge and ability. The desirable personality and character traits are well-known or are at least often enough discussed. But what professional ability is, and the distinction between it and trade skill, may not be so clear.

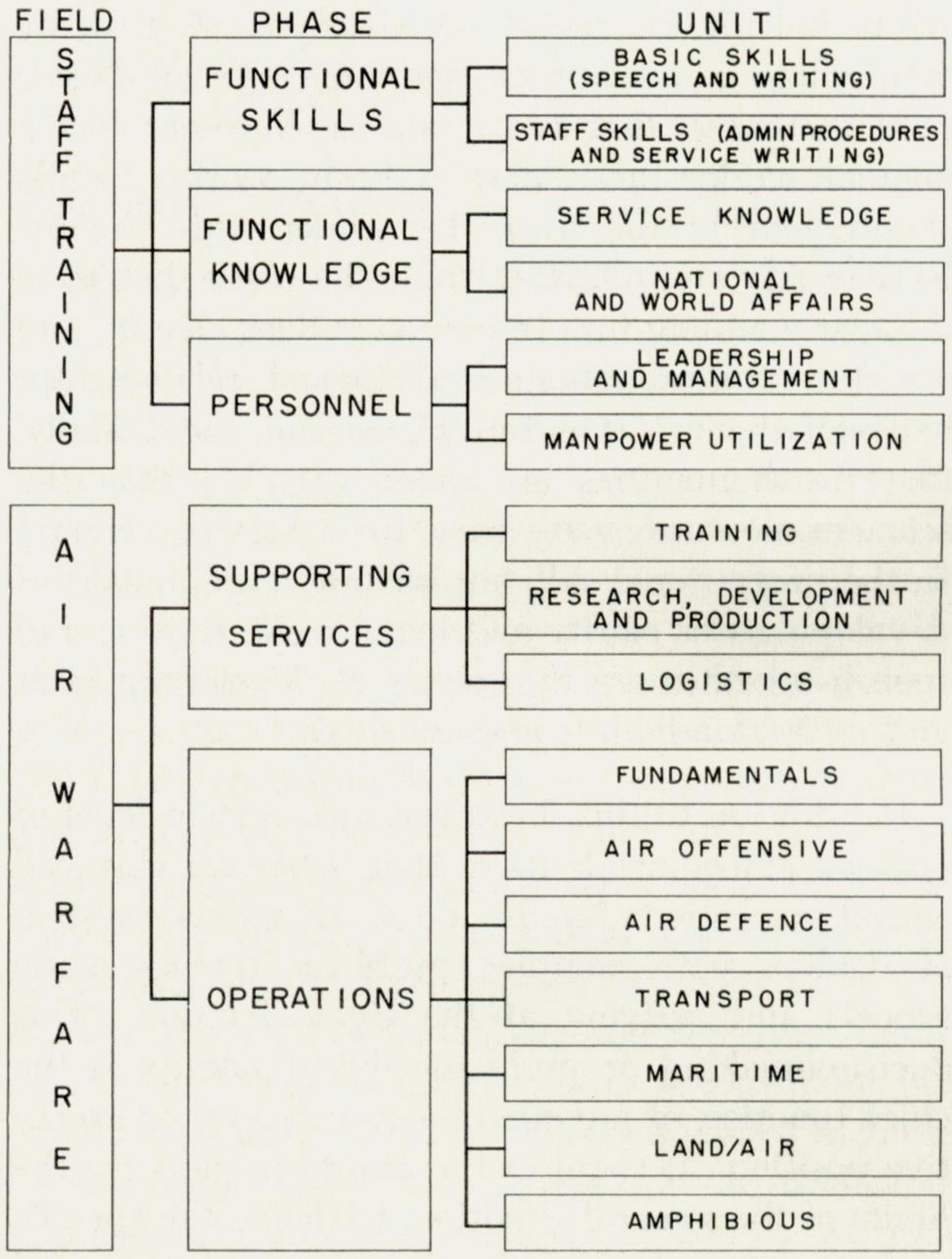
An officer's basic trade is the work he is first employed or trained to do in the Service. Flying is a trade. Engineering, even medicine, are trades in the military scheme of things even though they are quite validly professions in themselves. At the start of his career an officer applies himself personally and directly to the practice of his trade, without much concern about the relationship of his particular job to the air force as a whole.

However with time and promotion the officer uses his trade in this way less and less. Instead he applies it indirectly to guide the work of others, and gradually some of these others will have trades of which he knows little; he becomes, in effect, a manager or executive. Further, to direct his group efficiently, to make right decisions in problems his group encounters, he needs a more general knowledge, about among other things the structure of his and other Services, the nation's military and political aims, and the operation and doctrine of the combat arms of air forces generally. The knowledge and skills he needs to manage and direct make up professional ability, the schooling in which we may call professional education.

The Scope of Professional Studies

It is obvious that a junior officer would not need this ability in the same degree as would, for instance, an Air Commodore. But it is wrong to think that the syllabi of professional education for each of them are quite distinct and separate. Indeed we can say there is but one basic syllabus, within which emphasis and degree of detail can be varied according to rank level.

The syllabus defining the body of professional studies can be rationalized in many ways, each quite valid, depending on the criteria used. One of the most workable makes a division into two main study Fields, Staff Training and Air Warfare. As shown in the diagram, each of these Fields can be further divided into Phases and Units. The Staff Training Field covers the minimum an officer needs to do utilitarian administrative or staff work within his Service. The Air Warfare Field, in contrast, covers the employment of air forces in their operational roles, which is knowledge necessary for direction and command.



This method of layout while practical does not indicate the focal significance of the study of the "basic skill" of writing, and of Service Writing. These subjects are generously misunderstood by most people, who believe English to be a didactic pursuit of misplaced commas and split infinitives, and Service Writing a slavish drill in paragraph indentation and channels of correspondence. While the subjects can be and often are taught with as trivial an emphasis, their importance in the professional syllabus depends on a more profound

approach. Words are the vehicles of thought, so that a person's use of words can give an insight into his thought processes. By analyzing a person's writing (speech being fleeting and difficult to examine closely), the clarity and logic in his thinking can be seen and, with time and application and provided the latent ability is there, improved.

Once an officer begins to supervise others he begins to deal less with things than with the words representing things and with more abstract ideas. A Flying Officer pilot, for instance, has flying as his chief task, which he performs by manipulating controls. A squadron commander is charged with the efficiency of his squadron; if he notices a slackening of efficiency he may introduce a training program which he will formulate, not by trial and error, but by sitting at his desk thinking — by manipulating ideas rather than things. As an officer's rank increases, that is to say, he becomes less a manual worker and more a brain worker, while simultaneously the ideas he works with become increasingly complicated. Thus he needs habits of thought enabling him to perceive ideas clearly, and see fine discriminations and logical relationships between them. (It is for this reason, incidentally, that the humanities are more valuable than the sciences as a university basis for a Service career.) In the professional syllabus writing is the means of developing this clarity and logic, while writing and speech together are the means of developing clear and understandable communication.

In addition to this, however, at a certain level of rank an officer needs more than what we may call verbal precision to handle ideas. He needs a system of dealing with complex problems having many aspects and arriving at the right decision. This decision-making or problem-solving activity is the chief function of anyone in a supervisory or executive position. It requires the ability to perceive the limits of the general situation, to define the specific problem, to analyze all the contributing factors and relate them to each other and to the problem, and to formulate from this analysis a decision or course of action solving the problem. Not only does this sequence of operation facilitate problem-solving, it also is an efficient and practical pattern for presenting and communicating ideas in staff or managerial work as a whole. The pattern of general introduction, logical arrangement of relevant factors into argument, and conclusion based on the argument can be used in briefings, conferences, letter and memoranda writing, and all those activities which are the commerce of staff work. The pattern is, in effect, simply a system of orderly thinking essential at those levels of responsibility where more depends on a man's ability to see the heart of a matter than on his operational skill.

A few people come by this ability naturally, most have to acquire it by training, but in all it can be improved by practice. The significance of Service Writing is that it can give this training and practice. Letter and memorandum writing can be used to teach the effective arrangement of argument in its simplest forms. The appreciation is the embodiment of the problem solving process, and its composition is a demanding exercise of the faculties of analysis, synthesis, and judgment. These forms of Service Writing, together with such others as conference agenda and minutes, organization orders, and operation orders, can give the most useful practice in the logical classification, division, and arrangement of ideas, all of which is essential to the executive task.

The key place of "basic skills" and Service Writing in an officer's professional equipment is therefore this: He gets knowledge from experience and from most of the professional syllabus. But this knowledge benefits only himself if he cannot use it. "Basic skills" and Service Writing train him to use it effectively.

The Problem of Phasing

Transposing the syllabus into a practical working program is governed by a number of factors. Because of the syllabus' size and the inefficiency of correspondence courses and examination-based reading lists, the program has to be administered intra-murally. But because an officer should leave his work as little as possible, the time spent on intramural study must be a minimum. Further, professional education is preparation for the future; its single aim is to prepare officers for higher rank: thus the curriculum of each phase of study must embody an officer's future needs. These factors can be reconciled by interposing courses of study at two rough but realistic stages. A Flight Lieutenant or Flying Officer should have done his first tour in his trade. He will begin to have administrative jobs, and will be on the threshold of his permanent career. Not too long a course can prepare him for ranks up to and including Squadron Leader. Again, as a Squadron Leader or junior Wing Commander he will be entering a recognizably higher level of responsibility, and can be prepared for ranks up to that of Group Captain.

We may call these two educational levels the Staff School (for Flying Officers and Flight Lieutenants), and the Staff College (for Squadron Leaders and Wing Commanders). A comparison would show the College curriculum to be a development of the School curriculum; there would be a direct relationship of progressive continuity although the subjects would be the same syllabus subjects we have already discussed. The Staff School however would present subjects more specifically and domestically. It would teach standard R.C.A.F. procedures; its students would learn about their particular Service and how it works. At the College level the approach would be more general and speculative, and broader in scope. Students at the College would examine and discuss rather than learn, and their province would not be simply the R.C.A.F. but air forces and air power generally. The School student, for instance, would learn how to fill out the Confidential Personal Assessment Form according to standing orders. The College student would study the general problem of personnel assessment and evaluate R.C.A.F. procedures in relation to other Service and civilian procedures. At the School a student would learn air defence operational doctrine; at the College a student would analyze and criticize doctrine and participate in exercises involving the deployment of air defence forces.

At the Staff School clear logical thinking, problem-solving, and oral and written expression would be emphasized through work in English and Service Writing. The aim would be to instil habits of thought and procedure that the officer could develop after graduation to prepare for complex problems at Staff College and after. Just as these skills are a prime part of an officer's equipment, so it is important that their development be started early and not left until age has hardened bad habits beyond salvation. At the College there would be no more than a brief review of writing instruction; the emphasis would be on complex appreciations, many of which would involve group effort.

For one part of the syllabus the curricula of the two courses would be almost identical. In the Air Warfare Field, under "Operations", the unit called "Fundamentals" embraces the study of all that is new and significant militarily in electronics; bacteriological, chemical, and atomic weapons; aircraft and missile propulsion; and aircraft and missile design. So rapidly changing are these fields, and so great an impact do developments in them have on air forces, that a thorough comprehension of them is essential if an officer is to understand the future of his Service and of air power.

Finally, the Staff School would differ quite markedly from the Staff College in one important way. The officer attending the School would stand, as we have said, on the threshold of his permanent career. The School should therefore in a very real sense be the place where he learns what his Service is and what his place is in the Service, where he develops pride not simply in his particular branch, or his squadron, but as well in the air force and the military calling, and where he learns the ethics, responsibilities, and rewards of his profession. We would thus expect those parts of the syllabus covering leadership and management, but also other parts as well, and certainly the ceremonial and athletic program, to be designed to develop in the officer a sustaining esprit de corps.

Functional Problems

Having set up the curricula, we may now move to a more specific area of discussion and examine how the education program could be administered. We know that two institutions are needed, but because of differences in the curricula and of the emphasis at the School on writing, each place would need a different teaching method and type of staff. Many of the lectures needed at the School could be given by Squadron Leaders or Wing Commanders, whereas the College would draw its lecturers from the most highly qualified people available. Because writing can best be taught to small groups and can only be taught efficiently by specialists, we would expect the School to be staffed mainly by such specialists and to have classes of about fifteen or twenty students. The College, on the other hand, might need one such specialist as a consultant but would be mainly staffed by officers qualified to guide groups of twelve or fifteen students in the exhaustive discussion of advanced military problems. At both levels however these staffs would have to be of the very highest quality, for it is fundamental to all teaching that no matter how expensive the facilities or well-designed the curriculum, or even how good the students, a school is no better than its staff.

Another important principle guiding the staffing of both the School and the College is the need for research. Research is the study of new developments and thinking in the profession and the making of new exercises and lectures and the modification of old to reflect these advances. Without research the School's training material would fall out of date, its

teaching of procedures become patched and contradictory; the College's scope of enquiry would become narrowed, its doctrine obsolescent, and its thinking unimaginative. Both School and College must have enough staff to do this essential research in addition to their routine teaching.

In the light of curriculum and teaching methods, which must be the main considerations, the length of the Staff School course would be about five months and that of the College course eight or nine. The student enrolment at each level would be different, but here personnel factors would have greatest weight. The School's aim is to prepare officers for ranks up to that of Squadron Leader, and from this the School's enrolment could be limited to the number of Squadron Leaders the Service would need in the following years. However here the problem of selection would be very difficult. It might be wisest, in fact, to send all officers to the School, because all could make practical use of what was taught there. The thorough evaluation of students' intellectual capacities that could be made at the School could then be used to help select officers for promotion and for the College course. In this situation extra-mural examinations would not have to be a promotion qualification, although they might still be used to encourage the individual study which is an essential part of professional development.

The enrolment at the College would be smaller. The College's aim is to prepare officers for ranks up to that of Group Captain, and with the selection evaluation that could be done at the School it should be possible to limit the College enrolment fairly closely to the number of Group Captains the Service would need.

At this point we have seen how professional education is distinct from training, and that professional education has a basic syllabus which can be modified to serve each of the two education levels. We have seen that the School and College need different teaching methods, but because the basic syllabus is similar we could assume that to some extent the College's officer staff could lecture on School subjects. We have seen that each institution needs a research staff, as each would also have need of a library, and we can deduce that research staff and library could be shared. We have seen a further need for close liaison between School and College because of the School's selection activity, another factor in which might be the administering of extra-mural examinations on the continuous professional reading an officer would be expected to do between the courses. We could go even further, and say that officer development of which professional education is a major part is an entity distinct in itself, difficult to assign to any particular Command but most reasonably the direct concern of Air Force Headquarters. All these factors argue strongly for putting the School and College at the same place and under their own command, reporting directly to Air Force Headquarters.

"Our generation must not think it has done with rationalism because the rationalism of the past had to give place first to Romanticism, and then to a *Realpolitik* which is coming to dominate the spiritual sphere as well as the material. When it has run the gauntlet of the follies of this universal *Realpolitik* and has thereby got itself into deeper and deeper misery, both spiritual and material, it will discover at last that there is nothing for it to do but trust itself to a new Rationalism, deeper and more efficient than the old, and in that seek its salvation."

ALBERT SCHWEITZER

A Concept of Management for the R.C.A.F.

GROUP CAPTAIN F. R. SHARP

Group Captain F. R. Sharp, D.F.C., C.D., is Director of Management Engineering in the Comptroller Division of R.C.A.F. Headquarters.

THE effectiveness of a military force depends primarily on adequacy of equipment and on the expertness of the people who use the equipment. The R.C.A.F. obtains effectiveness by buying the best available equipment, by giving its personnel first class training and by providing sound leadership. But this does not ensure efficiency, for although a squadron may be properly equipped, manned by highly skilled aircrew, and led competently, the squadron's supporting staffs may, even while running a brilliantly effective fighting force, be most wasteful of resources. In fact this wastefulness is probable, because most of an officer's and N.C.O.'s training and experience are in operating and maintaining equipment and very little, if any, managerial training or authority is given him. Yet the need for officers and N.C.O.s who possess managerial skills exists today, and will become more compelling as time goes by.

The Need for Managerial Skill

The R.C.A.F. is one of the largest Government organizations, whether measured in terms of personnel employed or yearly budget. It employs over sixty-six thousand Canadians and spends about $860 million yearly, which is over twenty percent of all Federal Government spending and about three percent of the Gross National Product.

By civilian business standards the R.C.A.F. faces a most difficult management problem, for the scope of Air Force activities is much greater than that of large civilian enterprises. These activities range from writing specifications for, monitoring the manufacture of, and operating complex aircraft and electronic equipment, to provisioning and issuing shoe laces. Between these two extremes are found most of the occupations of Canadians in every facet of business and government life. Hospitals, schools, groceterias, garages, restaurants, police and fire stations, sewage plants, recreation programs, general stores, and a host of other functions must be managed effectively and efficiently. R.C.A.F. personnel are engaged in aircraft and vehicle operation and repair, in warehousing, advertising, photography, transport, employment, finance, education, law and in many other fields, any one of which is pursued on a scale larger than that of many Canadian enterprises who have one of these activities as their sole function. True, the R.C.A.F. employs specialists who ensure that the operation is technically effective but the management problem created by the size and diversity of these numerous activities is formidable. Air Force officers and N.C.O.s must, if they are to perform their jobs properly, be capable managers in almost any sphere of activity.

Moreover management in the Air Force is becoming increasingly more complex and expensive. Whereas a few years ago all that had to be managed were a few semi-skilled personnel, some relatively simple equipment, and a few buildings, the situation now is that a large number of highly skilled personnel, a much larger array of complicated equipment, and more all-embracing real estate complexes come under the managerial scope of Air Force commanders. And this complexity is likely to grow greater. As an example, the R.C.A.F. provisioned for approximately 225,000 different items of equipment in 1950, approximately 450,000 items in 1956, and it is expected that by 1960 this figure will have risen to 600,000 items. Equipment and techniques are changing rapidly, and management must develop at the same rate.

A final aspect which further increases the need for improved management is that more and more the Treasury Board Staff insist, and rightly so, that more objective information be provided on the uses planned for R.C.A.F. resources. The R.C.A.F. must be able to show that its affairs are efficiently managed or it will not get the resources it needs to carry out its role. Hence the need for a skilled and effective managerial team at each level of command.

If the management functions of the Air Force are to be performed expertly and with vigor its personnel must be capable managers trained in managerial skills and given the authority and incentive to use

these skills to the benefit of the Air Force and to their own moral satisfaction. Canada obtains maximum value for its defence dollar to the extent that this condition is met.

Delegation of Managerial Authority

The aim of our management policy is to make best use of our resources. The first step in forming a managerial policy is to decide on the level of command at which managerial decisions will be made, for only after this decision has been taken is it possible to devise management procedures and put them into effect. Procedures suitable for an organization which has delegated management authority are not likely to be suitable for an organization which has centralized authority at the top level of command. It is impossible of course to centralize all authority at the top level, nor is it possible to delegate all authority to the lowest level. Nevertheless, management of an organization can be either substantially centralized or decentralized. For example, General Motors decentralizes authority wherever possible whereas, until recently, it was the policy of Ford to centralize authority at the top level. The first problem is to decide which of these two concepts is more appropriate to the R.C.A.F.

At present we use both systems. Authority on operational matters is decentralized. The aircraft captain, the fighter controller, the station commander, all possess sufficient authority on operational matters to enable them to make decisions on the spot; and because they possess and exercise this authority, they become experienced and adept in making operational decisions. On the other hand the authority to make managerial decisions is held mainly at the top level of command, and in some cases by other government departments. The result is that managerial decisions of other than a routine nature are referred to higher authority for a ruling. The establishment or disestablishment of a position, the purchase of a labour-saving device, the improvement of an administrative procedure, all must normally be referred to higher authority for decision.

Our existing procedures permit the Commanding Officer of an all-weather fighter station to rule that each of his aircrews fly an extra two hours per month. The cost of this decision would be approximately $600 per flying hour, which would mean an additional monthly expenditure of $60,000. At the same time we do not normally grant a Commanding Officer the authority to buy a $26 labour-saving device, for most of our managerial decisions are communicated to the Commanding Officer by administrative and financial orders, by scales of issue, by maintenance procedures and standards, by establishments, and by a host of other orders, directives, and letter instructions. All of these are devised by higher authority and most of them outline precisely and in detail what can or cannot be done. The result is that when line officers see the possibility of effecting an economy they frequently do not have the authority to do so and must refer to higher authority for a decision. This does not mean that line officers have no discretionary power whatsoever in managerial functions. They are allowed some discretion, particularly if its exercise does not involve an expenditure of funds. Generally, however, the tendency is, as time goes on and more and more problems come to light, for additional detailed instructions and procedures to be issued by the top level of command.

This theory of centralized authority assumes that the people at Headquarters who determine the resources requirements and develop the procedures are better informed about what is required than is the man on the job. This superior knowledge exists in Headquarters personnel because they generally have had longer and more diverse experience than the station personnel, and because they can spend their full time determining the requirements; whereas the station personnel are fully occupied with their job of doing the work of the station. This system assumes that station personnel will determine where, without affecting operational effectiveness, savings can be made. It assumes also that they will either put these improvements into effect, or if they do not have the authority, request permission to do so. Centralization of authority has, to a certain extent, been forced on the Air Force by the Deputy Minister's and Treasury Board's Staffs who, before they will approve expenditures, demand detailed explanations of how funds are now being spent and how they will be spent in the future. To be able to give these explanations, the Headquarters tends to retain authority rather than delegate it to the field units. Close financial control by an impartial government agency such as the Treasury Board Staff, is indisputably a wise and necessary part of our system of government. What is needed however is a system of control which will enable Treasury Board to monitor spending without procedures so cumbersome and expensive that the economical use of resources becomes impossible. This involves developing cost standards and a post-audit system of control which would permit delegation of discretionary authority to the lowest level of command and at

the same time ensure satisfactory overall control by Air Force Headquarters and impartial government departments.

A system of centralized managerial authority was probably quite satisfactory for the small Air Force of yesterday, but it is quite inadequate on three counts when applied to the large and complex Air Force of today. Firstly, the size and complexity of today's Air Force make it impossible for Air Force Headquarters, which is remote from day-to-day operations, to be sufficiently informed to determine and to rule on the detailed procedures and requirements for field units. In addition, the sheer magnitude of the organization prevents decisions on detailed matters being made quickly by the Headquarters. The broad policies and expenditures and the desired end results can and must, of course, be spelled out by the Headquarters, and other government departments, for only at this level can a broad perspective view of the Air Force role be achieved and all efforts co-ordinated towards the fulfilment of the role. To believe, however, that the Headquarters is able to rule competently on detailed station-level problems is wishful thinking in the extreme.

Secondly, centralized authority in a large organization is wasteful in personnel, because it creates staff work and generates a large flow of correspondence up and down the chain of command. Each request for a change in resources or procedures must be considered by staffs at each level of command and often additional information sought before the modified recommendation is forwarded to the next higher level. By the time the recommendation reaches the level having the authority to make the decision it may have been modified so much that it no longer meets the need for which it was originated. Further, when the decision is made it must pass down through the same agencies in reverse order, modified and re-interpreted by staffs at each level, again generating more work and creating delay. This is not a criticism of staff officers but rather of a management system which fails to recognize that present communications techniques can not guarantee that a person receiving a piece of correspondence will glean precisely the meaning that its originator intended. If economical use is to be made of our resources the detailed decisions as to what resources are needed, and how and when they will be used, must be made by the people directly responsible for doing the work, who therefore know best what is needed and how best the work can be economically carried out.

Thirdly, in an organization which centralizes managerial authority at the top level, officers and N.C.O.s cannot be expected to strive continually and energetically for economy because the incentive to effect economies is practically non-existent. The result is that a great pool of potential managerial skill is wasted through inactivity because more time is spent in seeking authority to make improvements than in putting improvements into effect. The great majority of Air Force personnel are capable in their trade, honest, conscientious and hard working. Given the opportunity and incentive, each of them would, in his day-to-day work, make many improvements which would altogether amount to millions of dollars in increased effectiveness or in savings.

Under decentralized operational authority and centralized managerial authority, officers are assessed on how effectively – as opposed to how economically – the organization for which they are responsible works. Operational standards are clearly prescribed and those responsible have the authority on operational matters to ensure that everyone meets or betters these standards. The responsible officers do not, however, know whether their operational aims are accomplished at excessive cost. As an example, the Commanding Officer of a flying training school knows that the operational role of his station is to train pilots to a specified standard and he has the operational authority necessary to fulfil this role. He knows what is expected of him and can tell how well he is doing, and he is assessed accordingly. He is also judged by other criteria: the cleanliness and state of repair of his station, the morale of his personnel, the correctness of his accounts and inventory, etc., for each of which there are standards enabling him to know how well he is doing. Provided the Commanding Officer meets these standards with the resources given to him he is doing a satisfactory job. But in very few cases, if any, does an objective cost factor enter into these assessments. That he could have done his job at less cost is not objectively considered if it is considered at all, because we have not yet succeeded in devising a system which will relate operational accomplishments to cost. Yet such a system must be found if officers and N.C.O.s are to have the incentive to run their organizations economically as well as effectively. Not only must our personnel know what it is costing to run the activities for which they are responsible, they must also know what it should cost and, if they are to be expected to effect improvements, they must be given the author-

ity to make changes. Only in this way can we create the same incentive to excel in this field as has proven so successful in developing officers and N.C.O.s who are expert in their operational roles.

Managerial Standards

Coincident with the need to delegate more managerial authority is the need to develop managerial standards, for if our personnel are to exercise this authority intelligently they must have standards by which to measure the effectiveness of their actions. If they are to make most economical use of their resources they must have some idea of what an activity should cost, be able to spot inefficient and costly activities and be able to weigh, from an economic point of view, the pros and cons of alternative courses of action. For operational, managerial, and financial planning and control purposes, these standards should be expressed in terms which are useful, not only to the operator, but to all levels and functions of command. One of the most useful terms for expressing standards, from this overall point of view, is *dollar cost per measurable unit of work.* While there are other methods such as man hours per measurable unit of work, none have proven so universally useful as the dollar sign. It is more useful, for example, to say that the standard for operating station buses is so many dollars per passenger mile than to set a standard of so many man hours of maintenance work per passenger mile.

The choice of the work unit is often difficult and depends on the type of activity under consideration. It should, however, reflect the main purpose of the activity or bear a valid correlation to it. To use flying hours as the work unit of a transport squadron is invalid, because the purpose of a transport squadron is to carry passengers or freight. The work unit should, therefore, be ton miles or passenger miles, or some unit which is consistently correlated to ton or passenger miles and the standard should be expressed in dollars per ton or passenger mile. Correlated units should only be used where the use of such units will simplify and reduce the cost of recording the amount of work accomplished.

To devise and put into effect such a system of standards for all Air Force activities would take a long time, and it is likely that for a few activities the cost of maintaining such a system would be greater than the return. However, unless these managerial standards are set, our line officers and N.C.O.s will neither be able, nor have the incentive, to make a significant contribution toward improving the economy of Air Force operations.

The Operating Budget

While management standards will permit identification and elimination of, or improvement to, uneconomical or inefficient operations, they will not ensure that we live within our Air Force budget, because the volume of activity may exceed that provided for in the budget. For example, a transport squadron may be operating to maximum efficiency, but at the same time the operating costs of the squadron may be increasing because of an increase in the amount of freight to be carried. Clearly then, if we are to live within the funds allotted to the Air Force, some system must be devised which will control this type of fluctuating cost. While it is reasonably easy to control the main activities of the Air Force, it is by no means certain that this general control is sufficiently accurate to ensure a balanced use of resources. A more elaborate budget system than is now in use might well be introduced at all levels of command.

As an example, the amount of flying to be done is controlled within broad limits by Air Force Headquarters by controlling the number of aircraft and maintenance personnel allotted to a Command. The cost of mobile equipment operations is controlled by similar methods. However, it is still possible for commands and stations to greatly increase the volume of activity, so that some activities can be increased out of proportion to others. This could result in an unbalanced and unco-ordinated distribution of funds, so that more money would be spent on one activity than need be in relation to the amount of money remaining for other activities. Such a lack of control over volume of activities could result in the Air Force exceeding its budget so that operations would have to cease, or an increase in funds be obtained — either alternative being embarrassing. Finally, this lack of control could result in the Air Force failing to do the work it had planned to do in any one fiscal year.

The Air Force budget is approved by Parliament and controlled by the Treasury Board. Within the Air Force various directorates and branches in Air Force Headquarters and Air Materiel Command Headquarters ensure that the money is spent for the purpose for which it was approved. Overall and impartial control and financial accounting are the responsibility of the R.C.A.F. Comptroller Division. In this sense, financial expenditures, including operating costs, are controlled by a budget system. However, the form in which the Air Force budget is prepared, although satisfactory from an accounting

point of view, is unsatisfactory for managerial control purposes for two reasons.

Firstly, expenditures are not broken down to show the total operating costs for each activity. In order to divide the responsibility for the administration of expenditures between the various staffs, the budget is divided into segments according to function — a certain amount of money for personnel, a certain amount for construction engineering maintenance, a certain amount for clothing, etc. With the budget so constructed, how much it costs to engage in the various activities cannot be determined without much extra work. One cannot tell, for example, how much it costs to operate Air Transport Command or a particular station, or a particular mobile equipment section. Yet obviously if the officers responsible for these activities are to plan and control the costs of their operations, our budget system must show these costs. As an example, an M.E. officer, given proper standards, will be able to judge whether he is or is not operating efficiently, but unless he is given a budget he will not know whether the volume of his activities is in excess of that allowed for in the budget. Thus, he will not know whether his expenditures are or are not exceeding his portion of the total Air Force Budget. Thus if the volume of each of the numerous Air Force activities is to be kept in its proportion with the total Air Force effort, a system of budgeting by Air Force activity must be devised.

Our present system of budgeting fails to meet the needs of management control for a second reason in that responsibility for operating within a budget is generally retained at Air Force Headquarters and Air Materiel Command Headquarters level. In other words there is no one officer, except the Chief of the Air Staff, who is directly responsible for both effective operation and economical operation. Yet these two responsibilities are so intimately related that it is doubtful if they can be divided without adversely affecting both. To cite an example, the station commander of a flying training school is directly responsible for ensuring that his operational role of flying training is carried out within the prescribed training standards. He is not directly responsible for keeping his operations within a predetermined budget, yet action which the Commanding Officer may, within his operational authority, take to improve the effectiveness of his operations may increase the expenditures for his station beyond that allowed for in the budget. In this case the staff officer or officers at Air Force Headquarters responsible for control and administration of these expenditures have had that control taken out of their hands. Alternatively, action taken by an Air Force Headquarters officer concerning expenditures may limit the effectiveness of the Commanding Officer's operations

This undesirable situation can be overcome by introducing responsibility budgeting, with each line officer down to at least the Commanding Officer level and probably lower being given a yearly budget within which to work. Such a system would have the advantage, from the Commanding Officer's point of view, of letting him know how much he can spend on various activities. If he wanted to increase the activities of one of his sections, he would have to make corresponding savings in the expenditure of other sections. In other words, the Commanding Officer would be given the opportunity to develop and make use of discretionary managerial skills.

From the Command and Air Force Headquarters point of view, responsibility budgeting offers several advantages. Management control would be made easier because if the officer responsible for operating a station were also responsible for the direct control of cost, comparisons between the efficiency of stations and similar activities on different stations, could be made. Budget estimating would be easier because the cost of running each operating activity would be known, and planning could be done on a realistic basis with accurate cost figures available.

The adoption of responsibility budgeting would enable the Air Force to truly control the expenditure of the funds allotted to it — and guarantee their most effective use.

"Let it be well weighed what a security for a lasting peace there is in a defensible and powerful situation, and how likely weakness and improvidence are to be the forerunners of war."

THE YOUNGER PITT

Book Reviews

THE SOLDIER, THE STATE, AND MILITARY EDUCATION

"The Soldier and the State: The Theory and Politics of Civil Military Relations", by Samuel P. Huntington. (Cambridge, Mass.: Harvard U.P.: 1957). In Canada, S. J. Reginald Saunders, (Toronto) pp xiii, 534. $9.00.

"Soldiers and Scholars: Military Education and National Policy", by John W. Masland and Laurence I. Radway. (Princeton U.P., 1957). In Canada, S. J. Reginald Saunders, (Toronto) pp xx, 530. $8.65.

Reviewed by PROFESSOR RICHARD A. PRESTON, Royal Military College of Canada.

THE place and nature of the armed forces in modern democratic societies is a subject of immense importance in these days when the west is facing a continual military threat that endangers its survival. The problem is greatly complicated by the fact that our society, within which the armed forces must exist and operate, is itself in a state of flux. At the same time we are experiencing a technical revolution that is going faster and further than anything known to history. In face of this external danger, and of these internal upheavals, how can the west raise armies, how should it equip and train them, and what should be the place of our military leaders in the planning of state policy?

Two books recently published in the United States attempt to tackle some aspects of some of these big questions. Both are concerned specifically with the American scene and, since that differs in certain respects from what pertains in Canada, their usefulness for our purpose is not complete and automatic. The Canadian reader must bear this continually in mind. But both books deal with fundamental issues, and both set out theories and propose solutions which, if sound, could be applicable to our Canadian problems – with due modification.

Samuel P. Huntington, in *The Soldier and the State*, is concerned because he believes that the development of a military strength adequate for our present protection cannot be built up in face of the prevailing philosophy of American liberalism. Societies steeped with a horror of militarism and with an abiding distrust of standing armies are reluctant to entrust power to military leaders and to support large armed forces. American liberalism, says Mr. Huntington, does not understand, and is hostile to, military institutions and the military function. He argues, therefore, that if we are to survive in a time when an attack can come too swiftly for us to improvise emergency forces, there must be a shift in American values from liberalism to conservatism.

"The tension between the demands of military security and the values of American liberalism can, in the long run, be relieved only by the weakening of the security threat or the weakening of liberalism". "Only an environment which is sympathetically conservative will permit American military leaders to combine the political power which society thrusts upon them with the military professionalism without which society cannot endure". These two sentences sum up his solution for the problem of ensuring the survival of western society.

By liberalism and conservatism Mr. Huntington means, of course, certain political philosophies. He does not mean the creeds or platforms of particular political parties. For him, "the heart of liberalism is individualism". It emphasizes individual dignity and opposes restraints upon individual liberty. He does not use liberalism as it is currently misused in the United States to mean extreme left-wing doctrines akin to communism; and he also rejects that popular usage of conservatism which associates it with laissez-faire and with the protection of property rights. Conservatism is a philosophy which accepts existing institutions, recognizes the role of power in human relations, and suspects grand designs and theories. He argues that conservatism is inherently compatible with, and similar to, the "military ethic".

The military ethic is the pattern of beliefs of the professional military man. One of Mr. Huntington's premises is that the officer corps in modern states has become "professional" in the same sense that doctors, lawyers, and clergymen are professional men. This point was made in a somewhat different

way by Sir John Slessor in *The Central Blue* who wrote, "The main difference between soldiering today and twenty years ago (is that) the amateur status has disappeared and today it is no longer an agreeable part-time occupation for a gentleman but a very serious and whole-time profession".

When comparing this statement with much more detailed and thorough discussion of the growth of military professionalism presented by Mr. Huntington, one should remember that the historical evolution of England and the United States has been very different. Britain has had no political revolution. The delay in the growth of her military professionalism resulted from the continuance of aristocratic tradition in the officer corps. In America that tradition, if it ever existed, had been largely destroyed in the eighteenth century. If this difference is appreciated, Mr. Huntington and Sir John Slessor are saying the same thing.

Mr. Huntington dates the rise of military professionalism from the Prussian army reforms in 1808. He says that the development occurred because of the growing complexity of the science of war and sprang from a desire to match the genius of Napoleon and his marshals. Genius in leadership had been the basis of all eighteenth century military theory. In place of it the Prussians invented the idea of a thoroughly trained officer corps and a competent general staff organization.

While there is no doubt that Mr. Huntington is correct is saying that Prussia went ahead more rapidly in these directions, there can also be no doubt that the appearance of a professional military officer corps in place of the amateur aristocrats of the eighteenth century was due simply to the French revolution and its repercussions elsewhere. When the nobility were discredited, a new process of officer selection became necessary. The only logical alternative to noble birth as the qualification for a commission was an insistence upon military proficiency. The Prussians saw this earlier and more clearly than anyone else; but, by the invention of the General Staff system into which the brains of the army was collected, they managed for a long time to retain aristocratic privilege also.

However, Mr. Huntington makes professionalism mean much more than competence alone. He says that it means that a man is an expert in a certain field, that his knowledge is intellectual by nature, that it is capable of preservation in writing, and that it has a history. The professional man works in a social context and renders certain essential services to society. His effort is not induced or regulated by the normal expectation of financial rewards. He forms part of a body which has a sense of unity and which feels itself a group apart from laymen.

The expertise of the officer, says Mr. Huntington, is "managing violence" for the protection of the state. Mastery of this duty requires a broad background of general culture. The officer accepts a "sacred responsibility", namely the employment of his expertise for the good of society as a whole and not for his own self interest. In a modern army the professional motivation of regular officers contrasts with the motivation of citizen-soldiers who are conscripted, or who enlist because of economic or political appeals.

Mr. Huntington's emphasis on motivation as the essence of professionalism, rather than on the development of competence which might seem to many of us to be a more important component, is necessary so that he can develop the next step in his theory, namely that the fundamental aspect of military professionalism is the possession of a "military ethic". The military ethic is basically corporate in spirit, fundamentally anti-individualistic, and places unusual value on the orderly, purposive, study of history; but it is not bound to any particular theory. It emphasises the irrationality, weakness, and evil in human nature and stresses the supremacy of society over the individual, and the importance of order and a hierarchy.

The military ethic draws a sharp contrast between armed strength and bellicosity. Realising the importance of power in international relations, the professional soldier warns against the danger of aggression from outside and urges the necessity of adequate military organization for protection. But while he believes in the inevitability of war, he raises the strongest voice against immediate involvement. He is opposed to imperial aggression by his own state; and he is a firm believer in the necessity for civilian control over the state. As a professional he is anxious to serve his country through the use of his expertise, but he has no desire to meddle in political matters beyond his ken.

The best example of the professional ethic is to be found in Imperial Germany, which had the most professional army in Europe. The Prussian governmental system was carried over into the German Empire, and, according to Mr. Huntington, that system strictly limited the influence of the professional soldier and amply preserved civilian control. There were two separate structures of government under the Kaiser, one civil and one military. As the Kaiser was a civilian and served as the only link

between both systems, this is said to have been an ideal arrangement for keeping the military within their bounds.

Where Mr. Huntington seems to force his argument too far is in his classification of the Kaiser as a civilian, and also in ignoring the fact that when military and civilian advice conflicted, the argument that the military advice was aimed at securing the very existence of the state would inevitably prevail, especially when the military advice was tendered by an officer corps and a well-organized general staff which had direct access to a Kaiser who loved to pose as a martial figure.

All this defence of the German military ethic is apparently aimed at persuading the American public that generals do not bite and are therefore not dangerous. Mr. Huntington asserts that the argument for civilian control over the army as asserted in twentieth-century America is really part of the struggle for power between conflicting groups of civilian politicians. He believes that, in face of the urgent danger which hangs over the west, such a struggle can end only by the civilianizing of the military with a consequent loss of military competence. He seems to believe that if the public would realise that the military ethic accepts the fact of civilian control without question, military professionalism could be more fully developed and the military would become mere tools of the state.

He asserts that the leadership produced by the American officer corps has so far been "extraordinary", but that it was the product of an old pattern of civil-military relationships in which the lack of urgency allowed the military to develop their professionalism in isolation, neglected by the rest of the state and ignored by the public. He fears that the growing disruption of American civil-military relations cannot help but impair the calibre of military professionalism in the future. "A political officer corps, rent with faction, subordinated to ulterior ends, lacking prestige but sensitive to the appeals of popularity, would endanger the security of the state. A strong, integrated, highly professional officer corps, immune to politics and respected for its military character, would be a steady balance wheel in the conduct of policy".

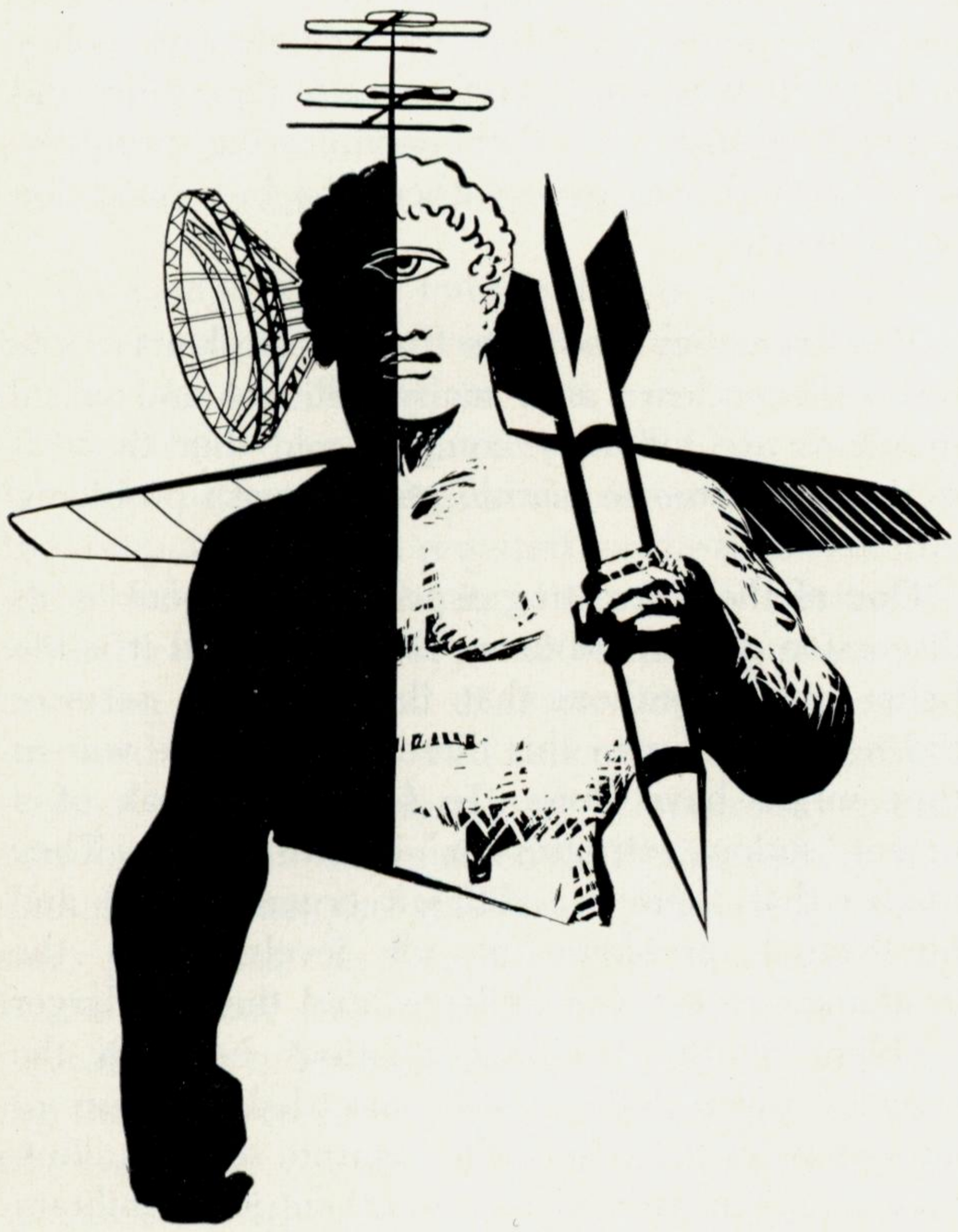
Such is the drift of Mr. Huntington's theorising and he raises many interesting ideas and provokes much thought. But he makes several serious errors in the premises on which it is based. He thinks that civil and military policy can be kept in watertight compartments. They never could in the past; and now, more than ever, they cannot be separated. He has failed entirely to see that this simple fact destroys much of his elaborate labyrinth of theory. Secondly he neglected to take into account the fact that much of the disagreement about military policy originated because of differences of opinion within the armed forces and does not come from outside them. War is not the simple matter which Mr. Huntington, in his innocence, believes. Those who are lured by his plea for more professionalism should weigh these difficulties carefully.

More serious still is the fact that this book is clouded by an abominable use of sociological jargon in which the chief aim seems to be to use several long technical words when one simple common word would do. All too often when the meaning is uncovered it turns out to be a perfectly obvious platitude that would not have seemed worth saying had it been put in simple language. Because of the use of this jargon this book is not recommended for any except the more determined of officer students.

BY CONTRAST the second book is admirable in its clarity of language and simplicity of exposition. Masland and Radway have written a most valuable treatise on the American set-up for military education which is a first in the field. Although their book is concerned with the American military system and with conditions and ideas in the field of education in that country, it has value for Canadians. This value is increased by the fact that an objective study of this kind could never appear in this country or in the United Kingdom. The British 50-year rule, for instance, by which national archives and government documents are closed to students for at least half a century unless one is given specific permission from the head of a civil service department to see a particular document, would make a study of this thoroughness impossible. Yet it is unlikely that such a study would ever be produced by anyone else but an impartial disinterested scholar.

The thesis of the book is based on the premise that the modern officer needs to know much more than his narrow professional task. As a U.S. naval writer once put it, during World War II naval officers in the Pacific had to be everything from father-confessors to pineapple growers. For such wide employment a general education is imperative. Moreover, at the upper level, service officers are called upon to make policy decisions which necessitate great powers of judgment. Masland and

Radway set out to survey the system of American military education in order to see how far it is geared to produce the right kind of man and the right kind of mind for this purpose.



Before World War II officer education had become a well established function of the American armed forces. Since that time, as the book shows, the services have come to attach ever-increasing importance to education. Yet this emphasis still has its opponents, many of whom are antagonistic because they themselves have risen to high rank and responsibility without the aid of higher education. It would appear, however, since the amount of education offered is on the increase, that many more senior officers feel the lack of an earlier general education and are anxious to promote and extend what is now available.

This book's survey of the courses offered in all three American services, from the academies to the war colleges, is too complete and detailed for summary here. In the course of this outline there are many useful judgments on aspects of military education which deserve some attention. Civilian critics have been too prone to underestimate the values of military education and this book should go a long way to revise this false impression. At the same time it is vigorously critical of certain aspects of the system. Since military educators have shown themselves to be in many ways more flexible about methods and curricula than their civilian counterparts, the book will be well received in the United States and will have a beneficial effect.

With regard to the lowest stage of military education, at the service academies, the book places greatest emphasis on their task of indoctrination. The military academies inculcate in the mind of the future officer-to-be an image of his role as a professional soldier, sailor, or airman. This task cannot be satisfactorily performed through civilian universities; but the authors feel that the R.O.T.C. schemes, with certain adjustments, have an important place in the production of officers from a broad educational background.

The broad general education pattern of the service academies is praised and it is emphasized that they are not engineering schools which, by our standards, is certainly true. But there is criticism of the time wasted as a result of the use of methods of instruction in the "tactical" and "executive" (i.e. professional) departments which sometimes follow techniques more suitable for training enlisted recruits. It is asserted that the loyalty and devotion of the officer corps is due to the indoctrination received at the service academies; but the book does not investigate the question whether this is due to the time spent in professional studies or to the atmosphere of the residential military college. Nor does it mention any student reaction against the time-wasting techniques to which it makes reference.

On graduation from his academy, the young officer enters upon a ten to fifteen year period during which he attends various courses to develop his professional military competence. These courses, most of which are taken at the branch schools of the army, at the navy's General Line school and other divisions of naval post-graduate schools, and at the Squadron Officer School of the Air Force, are not designed for the cultivation of those areas of knowledge and skill which are required by officers assigned to policy levels. The same comment applies to the Command and Staff Schools to which selected officers go to prepare themselves for the organization and employment of armed forces in combat and related support activities and are at the same time given an insight into the ways and outlook of their entire service.

The programs in all schools at this level are more in the way of training than education; but there has been a marked shift in emphasis since World War II toward the inclusion of instruction of a

broader kind. The Air Force Schools have gone furthest in this direction.

The most important extension of military education into the broad general field in recent years is the growth of senior level schools: the war colleges of the three services, the National War College, and the Industrial War College. It is this development which has done most to meet the demand for officers trained to assume the policy-making roles which the writers of this book believed to be now an essential part of the military function.

Along with this most useful survey of the curricula, faculties, and instructional methods of the various military schools and courses, there are thrown in some very interesting and stimulating comments which should give rise to lively debate. The authors assert that at the war colleges of the services the nature of the war for which preparation is being made varies with the accepted doctrine of the parent service. They regard these differences as dangerous to American security. They say that at the Air Force Command and Staff School there is a deep concern, "almost a pre-occupation", with the successful promotion of the Air Force's concept of the national interest. This pre-occupation is so strong that, being sensitive to the relative youthfulness of their personnel, and having felt that they were outmatched by the R.A.F. during the war in talking and writing, the air force school has paid special attention to the arts of exposition. The aim is to improve the bargaining and persuading power of air force personnel in its negotiations with the other services and government departments. The effect, of course, is to broaden the cultural content of the courses themselves.

The authors also state that some schools have been oversold on geo-politics, but they do not say which these are. They believe that the Air Command and Staff School and the war colleges make the study of international relations too much a matter of "we" and "they", or of "the free world" and "the enemy", and that the schools view policy unilaterally without due reference to their allies and without regard for other complicating problems which would exist even without the bi-polarization of the world.

However, they also state that the students at the war colleges learn that many political and social problems are infinitely complex and that there is sometimes virtue in learning to live with problems.

One of the interesting aspects of the book is its discussion of Joint Military Education and it is the belief of the authors that the American services did not go as far in this direction after the war as they might have done. In fact they speak of a recent "serious retrogression" in this respect. They realize that there are difficult organizational and intellectual problems at all levels, from the academies to the war colleges, and that the larger problem of the troubled relations between the services themselves is still unsettled because of alterations in the role of the separate services. But, they say, "measures to strengthen joint military education should not wait upon developments" in the solution of these bigger problems.

Altogether this is a most rewarding book and one which all connected with military education should read.

GLOBAL STRATEGY

By Air Vice-Marshal E. J. Kingston-McCloughry (270p., Clarke Irwin, Toronto, 1957, $3.75)

Reviewed by AIR COMMODORE K. L. B. HODSON

Air Commodore Hodson is Chief of Organization and Management at R.C.A.F. Headquarters and a former commandant of the Staff College.

A BOOK by Air Vice-Marshal Kingston-McCloughry is an event for thoughtful military readers. In "Global Strategy", he presents a useful tour d'horizon in which he reviews the political and military situation existing between East and West at the time of writing. He brings into focus the dominant position of the deterrent force, as well as the competing demands of the total, the limited, the local and the cold war. Within this general review, he emphasizes in terms of the Western World the need for an effective Allied strategy, and in terms of the United Kingdom the place of both

national and service strategies. These various strategies are examined against backgrounds of history, particularized interests, geography, and the accelerating development of new weapons. Clear notice is given that if Russian ambitions are to be thwarted, far more progress must be made than can be claimed so far in generating a single, cohesive Western Allied strategy, effectively supported by enlightened national strategies, properly subserved in turn by appropriately directed service strategies.

The composition of military forces today is complex by virtue of the competing demands of the various degrees of warfare than can be envisaged. Total war provides the gravest threat to survival and hence earns first priority for the deterrent force. Yet the weapons and units required for the deterrent are not all adaptable to the local war. This statement, while by no means new, points to the importance of assessing the likelihood of major powers becoming involved in small wars, and hence the corresponding degree of need for sustaining concurrently more than one system of armaments. In this regard, the author feels that the stalemate produced by both sides possessing the deterrent must inevitably lead to the Russian seeking to foment local wars as a logical outlet to his ambitions and thus to emphasizing the requirement for conventional forces. Since this book was written, however, we have had the spectacle of the Anglo-French Suez adventure abruptly arrested, apparently at U.S. bidding, and the pronouncement of the Eisenhower doctrine for the Middle East. These manifestations added to a former corresponding indication of policy for the Far East appear to serve notice that more and more of the earth's surface is being staked out into areas within which the U.S. will not tolerate major powers contributing to a local war. Indeed, in the light of recent events, it is hard to foresee an area in which Russia or China could support a local war without running the obvious danger of inviting total war. If such a conclusion can be drawn with confidence, then there would seem to be no further need to maintain types of forces tailored to this kind of warfare for so long as the deterrent is in effect.

A reduction in the types of armaments necessary is certainly an important issue. The author is very clear in his mind that the rapidly increasing costs of those weapons which each side must develop to keep abreast make it impossible to support concurrently all types of weapons. This is what underlies his concern over the present relations of the Services. Tradition, sentiment and vested interest lead each Service to support, without prime regard for the national interest, the functions for which each is best suited as being of top importance. The defence organization in the United Kingdom, which is described in useful detail, is designed to co-ordinate Service policies at the highest common denominator of agreement. This denominator, in practice, is sufficiently low to permit each Service to perpetuate individual aspirations. The time has come when "it is the function and not the Service which matters". To allow for an objective appraisal of what jobs are to be done, and by whom, requires a stronger central authority than now exists. In fact, the author foresees the overriding importance of new weapons, as well as their cost, leading inevitably to the political authority assuming a much greater say in what weapons will be developed and how they will be employed. This will result in a more centralized control at the military level as well, either in the form of executive power in the hands of the Chairman, Chiefs of Staff Committee, or by virtue of some alternative readjustment of inter-service relationships at the top. Again, the analysis of the British system can be studied profitably in relation to the structure of the senior echelon of the Canadian forces.

There is only one direct suggestion of Service integration and that has to do with Maritime strategy. Here, as it exists in both the British and the Canadian systems, the anomaly of shared responsibility for maritime air forces is criticized, more because of the lack of a single control of maritime strategy at the top level than because of disadvantages of the dual authority at the operating level. This absence of suggestion of a single Service is significant in a work which demonstrates so clearly and objectively the weaknesses of the present separation of the Services. Perhaps the author has studied the question of integration closely enough to be satisfied that the obstacles to union are too great. Alternatively, he may feel that the hiatus in defence preparedness that would inevitably accompany such a revolutionary change is unacceptable to an important military power at this period in history when continuous readiness is vital. If this latter is the case, one cannot help but feel that if integration of the Services is the only way to get unbiased military estimates of weapon requirements, then there is a unique opportunity for Canada to take up the experiment. While Canadian defence contributions are significant, they are not so essential in the overall Allied effort that a temporary lapse would be intolerable. If a successful pattern for a single Service could be defined, an organizational contri-

bution to Allied defence might be made which would far outweigh in importance the present provision of conventional forces.

In his preface, Air Vice-Marshal Kingston-McCloughry reveals the temptation of trying, when one is writing, to foresee every eventuality and to answer the arguments in advance, whereas, with a subject so wide in scope, this is not possible. While this must necessarily be the case, nevertheless a close reading of "Global Strategy" reveals an exceptional insight. The author is realistic in his appraisal of the lack of unity within the Commonwealth, of the preponderant power of the U.S., of the promising beginnings of NATO, of the deep-rooted differences of U.K. and U.S. policies in the Middle and Far East. In a surgical manner he dissects the strengths and weaknesses of the Services, his own included. While laying fair emphasis on the past, he seeks his vision in the future. Indeed, he offers, as an interesting competitor to the traditional principles of war, the principle of change. All in all, the breadth of the work, the careful, measured conclusions drawn, provide ample proof of profound, reflective thought.

The great value of "Global Strategy" is that it brings a complex picture into focus with all the multifarious detail clearly defined. The reader may wish to outline some areas more heavily or lessen the weight of others. But basically, he has the factors readily in view with which to assess his own particular problem. The more the intricate interplay of political and military facets, the surge of technical developments, and the claims of enthusiasts crowd in upon the canvas, the more important it is to keep a sense of perspective. Air Vice-Marshal Kingston-McCloughry has rendered an outstanding service in his latest book "Global Strategy".

AMERICAN DEFENCE AND NATIONAL SECURITY

By Timothy W. Stanley (202p., Public Affairs Press, Washington, D.C., 1956, $3.25)

Reviewed by WING COMMANDER E. H. M. WALSH

ALTHOUGH this book is an outline of the developments in the organization for defence in the U.S.A. over the past ten years, its dominant impression on a Canadian reader is likely to be the highlighting of some of the distinctive characteristics of the American system of government. When one considers the post-war developments in the American and Canadian defence organizations, the differences which exist between the two systems of government are quickly brought into focus. The Canadian armed forces were reorganized under a single defence department in 1946 with considerable despatch and the minimum of public controversy. On the other hand, the story of the re-organization of the United States military forces in 1947 actually predates the Second World War and is still going on with much controversy and bitterness. The re-organization plans forwarded by the administration have rarely been accepted by the Congress of the U.S.A. without considerable modification and compromise as a result of pressures brought to bear by various vested interests or "lobbies".

Admittedly, the defence problems facing the American legislators are much more complex than Canada's for a variety of reasons, not the least of which is the fact that the U.S.A. bears the chief responsibility for the defence of the West. Nevertheless, one does not need too much imagination to visualize what would happen under the American system of government if the Congress of the U.S.A. were presented with a bill calling for as drastic a reorganization of the defence forces as that recently presented to the British Houses of Parliament by Mr. Duncan Sandys. The peculiarities of the American system make it inherently difficult for a controversial bill to be made into law without much watering down by compromise.

"American Defense and National Security" traces the major developments leading to the re-organization of the U.S.A. military forces in 1947 and reviews in more detail the changes that have taken place in the structure and operation of the American defence organization during the years 1947-56. The so-called "Unification" of the military services of the U.S.A. was enacted by the "National Security Act of 1947". This bill called for a single Defence Department headed by a civilian secretary responsible for the "general authority, direction, and control of his establishment". It also established the "National Security Council" to ensure integration of domestic, foreign and military policies and effective co-oper-

ation between all government departments and the military services. In addition, the Joint Chiefs of Staff were given a statutory charter for the first time as "the principal military advisers to the President, the National Security Council and the Secretary of Defence".

However, there were riders to these general responsibilities. Perhaps the most significant were that each of the three services was to have its own secretary with direct access to the President, and that the Act ensured the independent status of each service and in effect forbade the appointment of a supreme military high command. These and other changes made by Congress resulted in a weaker "Unification" bill than was originally intended by its authors, the Army and embryo Air Force, but one that was somewhat stronger than most Navy supporters would have liked.

The book reviews the evolution of the "Unification" act in the nine years since 1947. Although changes have been slow in coming, some have been significant, including the strengthening of the position of the Secretary of Defence and the elimination of the anomaly of the service secretaries having direct access to the President over the Defence Secretary's head.

Inter-service rivalries including the so-called "Revolt of the Admirals" and "the Great Debate" are covered in what appears to be a most objective manner. Indeed, the author's treatment of his subject is on a scholarly level, without bias or partiality. One wonders why his final chapter entitled "Problems, Present and Future Tense" does not contain some specific suggestions as to how the present organization may be improved. However, Mr. Stanley, who wrote this book while a Research Fellow at Harvard University on leave from his post in the office of Secretary of Defence, is obviously well aware of the pitfalls of trying to make revolutionary changes under the American system of government. He seems to believe that evolutionary changes in the organization have the best chance of success in the reality of the American political system.

To my knowledge, no similar study has been carried out of the Canadian Defence Organization. For anyone who wishes to be fully informed of the manner in which American defence policy is formulated this book will be of considerable value. For those who may be involved in studies or plans for the re-organization of our own top-level defence organization, this book will be invaluable.

AIR POWER – THE DECISIVE FORCE IN KOREA

Edited by Colonel James T. Stewart, U.S.A.F. (321p., illustrated, Von Nostrand, Princeton, N.J., 1957, $6.50)

Reviewed by GROUP CAPTAIN M. LIPTON

"AIR Power – the Decisive Force in Korea" is a collection of articles on various aspects of the use of air power in the Korean War. These articles originally appeared in issues of the USAF's "Air University Quarterly" and have now been edited by Colonel James T. Stewart, USAF, and collected under a single cover.

Following the leading article, which is an analysis of the role of air power in the Korean War by General O. P. Weyland, who commanded the U.S. Far East Air Forces in 1953, there appears a series of articles dealing with the continuing battle for control of the air; techniques and results of applied air power against the enemy on the ground; the support which made the air offensive possible; and, finally, a brief analysis of the cost, mistakes and results of the Korean venture. There is an additional article which does not relate directly to the Korean War but sets out a case for the use of air power as a means of persuasion to encourage international behaviour that will lead toward a solid world peace. The authors of the articles are U.S. Air Force officers who played an active part in the activities about which they have written.

As one might expect from a series of articles dealing with many aspects of the same general subject, there is considerable repetition of some of the basic arguments. The consistency of the repeated points almost leaves the impression that a "party line" is being followed. However, the nature of the restrictions that were placed on air power's use in this war would have evoked the same reaction from any airman obliged to operate under similar conditions.

Although these restrictions detracted greatly from air power's effectiveness, nowhere in the book is

the need for or the wisdom of these restrictions questioned. The limitations on the type of weapons, targets, and geographical confines of operations were political decisions to be strictly upheld by the airman. But what the authors point out with great care is the need to bear these facts in mind in any assessment of the part that air forces played in this war. Air power was not charged with winning the war but merely with the prevention of a Communist build-up south of the Yalu River from which the enemy could launch a large scale offensive to drive the United Nations forces southward and into the sea. No attacks were permitted on targets north of the Yalu. This meant the Communists' lines of communications could only be hit near the front and not in the rear areas where much higher dividends per sortie would have been gained. Despite the handicap the job was done. Not a single airfield of 34 that the Communists tried to build, with the aid of thousands of coolie labourers, ever became suitable for operations. As each neared completion, bombers and fighter-bombers pounded it into rubble and debris. The Communists learned that an air force cannot be constituted or developed in an area where the foe maintains air superiority.

The Korean War saw the introduction of jet aircraft into combat. The first experience in the fighter-bomber role was unsuccessful because the F-80C aircraft's endurance did not allow it enough time in the target area, and its high take-off and landing speeds made it not too well suited for operations from the rough Korean airfields. The result was their replacement by the old-piston-engined F51's of World War II fame. However, when the battle became more stabilized and aerodromes improved, the F80 returned but was eventually replaced by the highly successful F86. The greater weight and higher tire pressures of jet aircraft called for more sturdy runways, which took more time to build. World War II criteria for airfield construction were no longer found to be valid and since it is unlikely that future aircraft will be any better suited to runways and airfields which can quickly be constructed by present methods, new and more efficient methods of design and construction are needed. Perhaps developments in vertical take-off and landing will one day eliminate this problem. It was learned that the structural strength built into the jets to withstand the force of high speed and acceleration also contributed to their ability to withstand considerable battle damage and still be capable of returning to base.

The operational status and mobility of SAC were admirably demonstrated when squadrons based in the U.S. were able to drop bombs on Korean targets within two days of being called upon. Fly-away maintenance kits contributed significantly to the bomber squadrons' ability to conduct intensive operations very shortly after arriving in the war theater. Heavy bomber squadrons used in the tactical role surprised many with the accuracy with which they dropped their bombs, sometimes very near the front lines. SHORAN, a World War II development, once again proved an invaluable bad weather precision bombing aid.

During the cease-fire negotiations period when the fighting was static, fighter bombers were called on to attack a well-dug-in enemy. Their effectiveness was little and the expense out of all proportion to the value received. The lesson of World War II had been forgotten – never use aircraft to do the artillery's job. Close air support works best along with a determined ground attack.

The saving of thousands of lives is credited to the efforts of air evacuation and rescue. The helicopter proved to be an invaluable device for retrieving airmen downed in enemy territory and for the removal of wounded ground troops to rear areas. Blood transfusions were started before the helicopter left the ground and were completed before it arrived at the Mobile Army Surgical Hospital in the rear.

REMCO, Rear Echelon Maintenance Combined Operation, was a very successful solution to the problem of logistics and maintenance at forward airfields. The tactical situation required that airfields be located close to the front lines. Owing to the need for security and the difficulties of transportation it was soon discovered that the maintenance of a full-scale logistic support organization on the forward airfield was not a feasible arrangement. Consequently, the maintenance facilities of two or more jet aircraft groups were combined at a rear area base to relieve the squadrons of their normal aircraft maintenance responsibilities. The result was an increase in aircraft serviceability, a higher standard of maintenance, and a considerable reduction in overhead.

Despite general opinion to the contrary the Korean War was a complex one. It was in a sense a laboratory study of the use of limited military action in a very difficult political situation. This war represented a short step in the direction of the use of air power as a persuasive force to attain

limited objectives. Unfortunately, since the cease-fire, the Chinese Communists have reconstructed the bombed airfields and have built new ones south of the Yalu River. On these bases they have stationed a sizeable force of modern fighters and bombers. In consequence, they have achieved in peace precisely what the United Nations forces prevented them from doing in war. This means that should fighting break out again in Korea the Chinese Communists are poised and strong whereas the United Nations position is very much weakened.

The book gives an excellent cross section of the part that air power played in the Korean War. For the professional airman it is a first class text book on the limited employment of modern air power. For the professional soldier it illustrates the need for gearing over-all strategy to the air situation and the capability of the friendly air force, as much as to the concept of manoeuver and fire of the ground forces. For the layman, it is exciting reading and an encouraging report on the state of readiness of the air forces of the United States.

MISSION COMPLETED

Autobiography of Air Chief Marshal Sir Basil Embry (Ryerson, Toronto, 350p., 1957, $5.00).

Reviewed by SQUADRON LEADER D. G. BELL-IRVING.

SIR BASIL EMBRY, G.C.B., K.B.E., D.S.O. (3 BARS), D.F.C., A.F.C., is proud – even egotistical – but his pride is tempered with a sense of humility; he recognizes the virtue in service. "Mission Completed", his autobiography, is the story of a great airman.

Sir Basil joined the R.A.F. as a pilot in 1921 when he was eighteen years old and served in Iraq and on the North West Frontier of India. But India was a long way from the hub of the R.A.F. and when in early 1939 he returned to England he found himself "an airman of a past age, and an officer whose professional knowledge was so lacking as to make me unworthy of my rank (he was a Wing Commander) and unfit to shoulder the responsibilities which lay ahead."

Needless to say, Embry soon made himself fit. Throughout the war he drove himself and his subordinates relentlessly. At the same time, he thoroughly embarrassed his superiors. With no authorization, and sometimes in the face of official opposition, he threw out the obsolete guns on his bombers and mounted effective ones; used a scarce new weapon for synthetic training when it became evident that his crews were dangerously green in combat; requisitioned precious farmland and lengthened to 3 miles the runway at his night-fighter station to help crippled aircraft to land; continued to fly on highly dangerous missions even after he had escaped from German hands under circumstances which left a price on his head. In short, he did all the sort of things that, from the point of view of his combat forces, a leader in war ought to do. His forthrightness and his personal daring made him loved by those who worked for him, but the love was tinged with awe.

After the war, Embry, promoted to Air Marshal, took over Fighter Command, built it up from the skeleton to which it had been reduced and re-organized its radar control and warning system. In 1953, with the rank of Air Chief Marshal, he moved to Fontainebleu as Commander-in-Chief Allied Air Forces, Central Europe. This was to be the final appointment of his service career. With a hand-picked staff (among whom as Chief of Staff was Air Marshal John Plant of the R.C.A.F.) Sir Basil set about expounding air power doctrine in the military councils of N.A.T.O. But his hopes of integrating the air defence of Western Europe and bringing about more than a superficial acceptance of the implications of nuclear war were not to be realized. He was frustrated by "the military mind", his term for staff officers of the French and United States Armies whom he found unwilling to drop cherished notions about the pre-eminence of land warfare. Sir Basil and his superior in N.A.T.O., Marshal of France Juin, were equally individualistic, and neither was inclined to appreciate the other's point of view on professional matters. Nevertheless, they were genuine friends and when in 1955 Sir Basil's tour of duty was not extended, as he had hoped it would be, Marshal Juin disclaimed any responsibility for his being replaced.

Embry is blunt when opportunities for bluntness exist. For example, on conscription:

"No flying service in the Western world can thrive on cheap labour, which is what national service amounts to, and those who argue that it can are doing a disservice to their country."

On the Ministry of Supply:

" . . . those responsible for the fighting efficiency of the Royal Air Force no longer control its weapon policy . . . (would) the Royal Navy have survived the test of time and served us so well over the years if the Admiralty had been forced to hand over its research, development, control of ship construction and ship trials to an outside Ministry manned by civilians who had never been to sea or studied the art of naval warfare?"

The style of this book, particularly its earlier passages, makes it read like something by G. A. Henty, which isn't surprising because quite apart from being history, which it is, it is also high adventure. If one is to appreciate the significance which underlies this biography one must read it with an understanding mind and not be thrown off by the pervading note of egocentricity. Sir Basil reminds us that there are military virtues and that service can be entirely satisfying – if one accepts the reason for it and singlemindedly commits oneself to it. Furthermore, his misgivings regarding N.A.T.O. defence planning cannot be dismissed – even though an air force general is now Supreme Allied Commander Europe. In the minds of many influential Europeans and Americans the nominal unit in the arithmetic by which they gauge military effectiveness is still the army division, and an obsolete form of the army division at that.

RADIATION – WHAT IT IS AND HOW IT AFFECTS YOU

By Jack Schubert and Ralph E. Lapp (314p., Macmillan, Toronto, 1957, $4.50)

Reviewed by O. M. SOLANDT

Before he became Vice President, Research and Development, of Canadian National Railways, Dr. Solandt was Chairman of the Defence Research Board.

THIS is a book with a message – a timely and important message of concern to every intelligent human being. Like all books with a message, it departs at times from its air of scientific detachment; the authors do not always give equal attention to both sides of the problem, but in general it is a very fair statement of the case. The fundamental message that the book conveys very lucidly is that radiation is the number one public health problem of the immediate future. Apart from the normal background radiation which has always been a part of man's environment, modern man has to cope with radiation from three new sources. These are (1) the use of x-rays, radium, and radioactive isotopes in the diagnosis and treatment of disease; (2) the radioactivity associated with the peaceful uses of atomic energy, and particularly the production of power from nuclear sources; (3) the radioactive hazards of limited or total atomic war – this includes also the hazards due to the testing of atomic weapons in peacetime.

The damaging effects of radiation of all kinds are discussed very clearly in a way that should be intelligible to any reasonably educated reader. The vexed question of genetic effects is handled well – it is made quite clear that even small amounts of radiation applied to a lot of people may have bad effects on the population in the future.

The radioactive hazards of atomic war are so spectacular that they have tended to preoccupy the public mind. In this book the authors quite rightly place great emphasis on the existing hazards of diagnostic and therapeutic uses of x-ray and radium and on the foreseeable hazards of trying to handle large amounts of radioactive materials in nuclear power plants. The safe disposal of radioactive waste products is a particularly thorny problem. It is fraught with technical, legal, and political difficulties. When nuclear power becomes widely used the whole of mankind will have to exert considerable caution in order to avoid contaminating the planet quite seriously. This is going to involve tremendous problems in regulation at every level from local municipalities to world organizations. As the authors rightly emphasize, adequate control can only be based on widespread understanding of the nature of the problems. This book is a serious, and I think successful, attempt to contribute toward this understanding.

Anyone who is interested in the important problems of the present and future will find this a thoroughly interesting, readable and important book. For those in the Armed Forces who may have much more intimate contact with the problems of radiation, its message is even more important.

THE ORGANIZATION MAN

By William H. Whyte, Jr. (428p., Simon & Schuster, N.Y., 1956, $6.00)

Reviewed by W. E. BLATZ

Dr. Blatz is Director of the Institute of Child Study and a member of the faculty of the University of Toronto. He is a regular lecturer at the Staff College.

"THE ORGANIZATION MAN" is a readable, thought-provoking book by a lay philosopher, psychologist, sociologist, and economist. William Whyte, Jr. has focussed his understanding in these fields upon the modern employees and employers of big business. Whyte is a competent journalist with a touch of the antithesis of G. K. Chesterton and a gift for quoting the apt example reminiscent of William James and, unfortunately, more than a little of Billy Graham. He has, however, made intelligible to the sophisticated as well as the naive reader a great many of the conflicts that necessarily and salutarily arise in modern life.

In the main, this book is an analysis of how the people (and perhaps it includes all of us) who belong to or are dependent upon the huge cartel-like organizations deal with the age-old problem of conformity vs. non-conformity. The author seems to feel that the balance is being inevitably, irresistably and unfortunately, skewed towards conformity. Not only does he state this as a fact (he quotes statistics, sometimes as unreliable as those he scoffs at) but he decries the attitude on the part of this "organization man" that conformity should be fostered. Very cautiously, he suggests that this attitude is pervading the human race beyond the United States. If his contention is correct, then all mankind will be exposed to the influence of the newly defined *Social Ethics*:

> "By social ethics I mean that contemporary body of thought which makes morally legitimate the pressures of society against the individual. Its major propositions are three: a belief in the group as the source of creativity; a belief in 'belongingness' as the ultimate need of the individual; and a belief in the application of science to achieve the belongingness."

These three beliefs, if taken literally, deny the efficacy of individual autonomy, and it is just this tendency that the author deplores and against which he is warning the thinking man. Specifically, Whyte sees the danger in our ideas emerging only out of committees; in man today being so fearful he cannot live, let alone think, except in a group; and in the scientist beginning to be drawn into the circle of dependency so that he will soon be only a how-man instead of a why-man.

If the author's data are sound, and if he has interpreted them accurately, then he has ample grounds for this apprehension. But the reader may ask if it is complacent to believe that in the past there have always been only a *few* who have thought dangerously, creatively, and provocatively. What little evidence there is indicates that instead of there being relatively fewer there are relatively more such people in the world today. How many work for big business, or want to do so, is a question to be answered.

The chapter on tests and testers is one of the best in the book. Swift did very little better in his satires. Although the battle has been raging in the academic (*sic.*) journals, it needed an intelligent lay interpreter to portray so well the flimsy structure upon which "testing" rests. Perhaps some of the higher executives will read this chapter, and especially the most delightful appendix on *How to Cheat in Personality Tests*, and then ask of the testers: "What exactly are you testing?"

The crushing of potential genius comes in for a cutting and telling diatribe. The emphasis on company loyalty to the exclusion of all personal ambition in a chosen field is well documented towards the conclusion that "Company loyalty . . . . is not only more important than idle curiosity – it helps *prevent* idle curiosity, – " (italics, the author's).

Whyte comes closest to an analysis of *fundamental* motivation in his discussion of friendship. He discusses the supplying of the individual's want for friends of various kinds; close friends, casual acquaintances, special social groups, familial contacts, etc. The pressure for conformity is again stressed, for, in the author's words, "It is frightening to see the cruelty with which an otherwise decent group can punish the deviate . . . . " But one wonders whether this is a *new* pattern. Surely the deviate has so been treated since the dawn of human history. There have always been deviates, and they have always been shunned, burned, tortured, and some-

times honored. One does not condone this phenomenon but it goes far deeper than company loyalty.

The schools are examined in the light of the growing submergence of the individual. Parents want their children to "get along with other people" and the school must accept this philosophy. At the expense of being an iconoclast, I suggest that this skill of getting along with others is not incompatible with individuality – but individuality is as rare in the teacher as it is in any other profession. Furthermore, individuality, if stressed too much, approaches chaos both socially and intellectually.

In the last chapter, the author becomes constructive. He says "There is no solution", meaning a counteractive program. But he suggests that further experiment and study in "human relations" (his quotes) may be productive and that out of this may emerge a pattern leading to an eternal sequence, "more effort, more skill, more *self-respect*", and so we return to one of the eternal verities "self-knowledge, self-reverence, self-control . . . . ".

This book can be recommended with only this reservation: One should be on one's guard against being carried to conviction on the very lucid, ever-persuasive prose of a skilful author.

AFTER STALIN, WHAT?

The Communist Party of the Soviet Union, by Boris Meissner (Edited and with a chapter on the Twentieth Party Congress by John S. Reshetar, Jr.) (Praeger: New York, 1956)

Krushchev and Stalin's Ghost, by Bertram D. Wolfe (Praeger: New York, 1956)

The Big Thaw, by C. L. Sulzberger (Harper & Brothers: New York, 1956)

Reviewed by WING COMMANDER J. GELLNER.

IN THIS REVIEW there are lumped together three books which have nothing in common except that they all deal with post-Stalin Russia. In all other respects they differ: in their approach to the subject; in their purpose; in their literary and scientific weight; in their area of investigation. Yet, taken together, they provide the very best basis for further study of the Russia of the Krushchev and Bulganin (or is it Krushchev and Zhukov? or only Krushchev?) era. Boris Meissner, outstanding German expert on the Soviet Union, provides the basic facts and figures. Bertram Wolfe furnishes much of the historical background as it is relevant to today's problems. C. L. Sulzberger, distinguished journalist, gives a valuable first-hand account of Russian public and private life after the death of the great tyrant.

Without saying so outright, Sulzberger advances three main propositions. Firstly, "Any alternative to coexistence is too awful to contemplate. Therefore, we should examine the post-Stalin Russia and seek to ascertain if there is any basis for accommodation." Secondly, "Moscow, with great audacity, has decreed a Big Thaw in its empire. Should this prove meaningful, its consequences to the communist system are far more dangerous than to ourselves. Let us attempt by every means to stimulate it." Thirdly, "Wherever the course of communism can be checked abroad it will ultimately develop within itself frictions and inherent cleavages as Titoism, Maoism and the other nationalistic Socialist philosophies mature. Or it must revert to monolithic Stalinist forms and crack. For its empire is too large for any single autocratic center." The first of these three propositions will be readily accepted. As to the other two, Sulzberger does an able job of developing and supporting them, but he is not always convincing. Nor can it really be expected that he should be. His book is not meant to be a deep analysis of contemporary communism, but rather a collection of observations, musings, and judgments of a very experienced journalist who is neither an expert on Marxism nor on the Soviet Union. Hence a certain superficiality—which, incidentally, the author admits quite frankly in his postscript. The sometimes bewildering transitions from one subject to the next are explained by the fact that a good deal of the material in the book first appeared in Sulzberger's column in the *New York Times* so that, in some parts at least, *The Big Thaw* is an attempt to bind together a number of already developed, but originally unconnected thoughts.

If Sulzberger's book is rather light-weight, it makes excellent, often thrilling, reading for one

simply interested in what has been going on behind the Iron Curtain since Stalin's death. Some parts of *The Big Thaw* are outstanding, and among them the very best are those in which the author deals with a country and with people whom he really thoroughly understands: Jugoslavia and the Jugoslavs. He gives an excellent description of the Jugoslav regime's efforts of political tight rope walking between orthodox communism and democracy; and a most lucid account of the heresy of Djilas and Dedijer, the two strange idealistic realists whose deviation is that they insist on calling a spade a spade.

Of particular interest also is Sulzberger's explanation of the Soviet fiscal system, and of the U.S.S.R.'s policy (or rather policies for they are different at home and abroad) toward Islam. Finally, it is worth noting that the author has some harsh things to say about Western propaganda beamed behind the Iron Curtain, and in particular about the broadcasts of Voice of America and Radio Free Europe. Here, Sulzberger undisputably can speak as an expert. He recognizes, of course, the very great difficulties with which Western propaganda agencies have to contend, but as a newspaperman he finds it inexcusable that they so often miss important events, that they are often late, and, what is worst, often wrong.

WOLFE'S book acts as a counter-weight to Sulzberger's essentially optimistic outlook on the consequences to the free world of the course of Soviet policy after Stalin's death. As a historian and one of the world's foremost experts on Soviet affairs, he sees no evidence that anything more than a superficial face-lifting has taken place in the Soviet Union. Krushchev may not yet be surrounded by all the trappings of an autocrat, but the parallel between his progress and Stalin's is very marked. In this connection, the author amusingly points out the graduations in the officially noted reactions to the speeches at the Twentieth Party Congress of the top Soviet leaders:

"No one but Nikita Krushchev received 'stormy, prolonged applause, transforming itself into an ovation. All rise.' Bulganin got 'continued, long-lasting applause. All rise.' But no ovation. Mikoyan got 'stormy, long-lasting applause,' but no one rose.

Molotov, Voroshilov, Malenkov and Suslov got 'stormy, continued applause.' Kaganovich and Pervukhin only 'stormy applause.' Kirichenko only 'continued applause.' Saburov only 'applause.' Such is the code that measures spontaneous enthusiasm at the new Byzantine court . . . . "

The greater part of the book is taken up by the text of Krushchev's famous denunciation of Stalin and his works, accompanied by the author's commentary which serves to set the facts straight. But Wolfe goes farther than that. Ever since the Krushchev speech first became available to Western readers through its publication by the U.S. State Department in June 1956, it was quite apparent that the anti-Stalin tirade was a fantastic collection of some patent untruths, and many more half-truths or truths twisted to suit the speaker's purpose. It would not have amounted to much had Wolfe simply pointed out where Krushchev lied or varnished the truth. What is much more important are the commentator's deductions on why Krushchev made this or that of his statements. It is from these deductions that the reader gets an insight into the Soviet political jungle – and, in the process, is convinced that "the more things seem to change, the more they remain as they were." After all, what difference is there between the "purge of the purgers" of 1938, when Beria hoisted himself up over the dead body of Jezhov, and the "purge of the purgers' purger" Beria in 1953? Or between Beria's rank ingratitude toward his old sponsor and protector, Orjonikidze, and Krushchev's toward Kaganovich?

AT FIRST SIGHT, Meissner and Reshetar, in their accounts of what happened at the Nineteenth and Twentieth Party Congresses, merely present the outward manifestations of what appears to be a period of transition in the Soviet regime. In fact, they probe much deeper. Meissner, for instance, points to some signs of a deliberate watering down of the official Soviet ideology: the significant change in the party name; and such meaningful changes in terminology as the substitution of the term "socialist system" for the old "dictatorship of the working class." Reshetar's chapter was obviously written before it became known that Krushchev had made a slashing attack on Stalin's memory. Even so, he arrives at the conclusion that while Stalin will be down-graded (or even degraded) his methods of government will be in all major respects continued by his heirs – and by his ultimate heir. Meissner expresses the same opinion in his short, lucid explanation of the collective leadership principle. He, too, believes in the coming of another Stalin: " . . . forces are at work to strengthen the monocratic element. The experience of history allows us to assume that these

tendencies, which are inherent in every autocratic system of rule, will sooner or later prevail in the Soviet Union also."

Meissner's is also an excellent reference work, containing among other things a most valuable abbreviated "Who's Who" in the Russian Communist Party. As such it will help the reader of Sulzberger's and Wolfe's books – and will remain useful to those who might decide to delve deeper into the available material and try and answer for themselves the great question of our time: "Quo vadis, Russia?"

NATO – THE ECONOMICS OF AN ALLIANCE

By Ronald S. Ritchie (147p., Ryerson, Toronto, 1956, $3.00)

Reviewed by JAMES D. FORBES

THIS concise and timely work is deserving of a wide readership. It reveals a thorough understanding of the difficulties the Atlantic Alliance had to face in its formative stage, assesses objectively the degree of accomplishment and failure in the concerted effort of meeting the military challenge of communism, and touches on the present delicate problems confronting the member countries in adjusting to the new strategic situation. Although far from being a complete analysis of the economic variables which have played and continue to play a major role in shaping the dimensions and structure of the North Atlantic Treaty Organization. the author does focus the reader's attention on the key problems with a high degree of skill.

It is the stated aim of the work to review the economic problems which affected the development of the defensive alliance: the problems of "creating forces of minimum deterrent proportions at a tolerable cost", of the size of the burden, and of the equitable sharing of the burden. It attempts to assess the relative economic strengths of NATO and the U.S.S.R.; examines whether NATO possesses the basic economic strength necessary for the continuing struggle with the U.S.S.R. in the battle of "competitive co-existence"; and considers whether the mere sharing of a defence effort is sufficient to cement an enduring association of the Atlantic Alliance, or whether some broader purpose is necessary to command the continuing loyalty and support of the members.

Mr. Ritchie is of the opinion that the most important phase of the struggle between the Soviet Bloc and the West is in the economic and political sphere. "It is evident", he states, "that the basic economic strength, actual and potential, of the NATO nations collectively is and will be a factor of decisive importance in the world struggle", and he raises the question whether the NATO countries have the economic strength to maintain adequate defence forces and still ensure a high rate of economic growth while at the same time countering Soviet competition in the under-developed areas. Referring to the collective economic strength of the West, he adds, "If there is a danger, it lies less in the means than in the vision and the will", and makes a plea for sacrifice and discipline in order to provide both adequate defensive strength and economic growth.

Probably the most useful chapters in Mr. Ritchie's work relate to the sequence of events which culminated in the North Atlantic Treaty. The decision to re-arm came hard and was taken reluctantly. Only the full realization of the real attitudes and aggressive purpose of the Kremlin prompted the development of collective security forces. In Western Europe it was feared that the demands of re-armament would divert resources from post-war economic recovery and the industrial rehabilitation of war-torn areas; while in the United States, there was hesitation and irresolution at the prospect of accepting not only the role of leadership but the main cost of building up the North Atlantic defence.

The author feels that Canada has exercised a significant leadership function in advocating a regional security pact and "in her persistent sponsoring of a broader objective for NATO than purely military defence". He summarizes Canada's participation as being marked by "a determination to play her full part without endangering her sovereignty and a desire to maintain her influence as a leading military power with a special relationship to the United Kingdom and the United States". On the whole, he considers that Canada's contribution to NATO, militarily, economically and politically has been a valuable one.

Mr. Ritchie expresses some uncertainty as to the future of NATO and suggests that there is a need for a reappraisal of needs and purposes. He states that two questions are paramount: first, the evolution of mutual defence programs to develop an adequate deterrent composed of retaliatory and shield forces, as well as the capability to counter lesser threats; and second, the development of a higher degree of unity and compromise in broader fields of policy, particularly foreign policy. Mr. Ritchie, of course, raises many questions and provides few specific answers, but his background analysis of NATO'S development will be of inestimable value to the general public in achieving a better understanding of the present problems confronting the NATO alliance.

SHIPS IN THE SKY

By John Toland (352p., Illustrated, George J. McLeod, Toronto, 1957, $5.75)

Reviewed by WING COMMANDER F. H. HITCHINS, R.C.A.F. Air Historian

ON 3 JULY, 1900 the first Zeppelin airship rose from the waters of Lake Constance. On 6 May, 1937 the Hindenburg, the 128th airship built by the Zeppelin works, exploded in flames over the landing-field at Lakehurst, New Jersey. Between these two dates, from birth to holocaust, lies the life-span of the big dirigibles which are the subject of Mr. Toland's "Ships in the Sky". The author uses the familiar technique of reconstructing the sequence of events from the evidence of survivors and eye-witnesses, scores of whom he interviewed in the course of his research. Sometimes his zeal for pinpointing each participant tends to cloud the story; but on the whole it is skilfully told and make a vivid chronicle of one era in the history of aviation.

The prologue to the era begins with the "amazing" Dr. Solomon Andrews of Perth Amboy, N.J., who between 1862 and 1865 experimented with airships which, although they had no motors, could be manoeuvred by some principle of "gravitational propulsion" that still remains a secret. A generation later Santos Dumont endeared himself to France by producing a powered airship; he was the first man to circle the Eiffel Tower by air and he built, in all, fourteen airships before his interest turned to heavier-than-air craft. Next on the scene was Count Zeppelin who, undaunted by the failure of his first two rigids, finally achieved success with the LZ-3 in 1906. Between 1909 and 1913 Zeppelins made 1600 flights of 100,000 miles without loss, and their use as military weapons in the Great War is well known.

Mr. Toland's story gets into its stride with his account of the post-war years when the world was alternately thrilled by the successes and horrified by the tragedies of the big airships. In 1919 the British R-34 crossed and recrossed the Atlantic, but the R-38, acquired by the Americans, broke up over Hull in 1921. A year later, the explosion of the *Roma* ended the use of hydrogen in the American airships, but helium was no guarantee of safety against weather, as the loss of the American-built *Shenandoah* showed in 1925. Moreover, helium was in such short supply that at first the U.S. Navy was able to operate only one of its airships at a time.

Although France had given the balloon to the world in 1783, she played a minor part in the development of the dirigible, and when the *Dixmude,* a Zeppelin spoil of war, disappeared over the Mediterranean in 1923 French enthusiasm for dirigibles vanished with it. Italian semi-rigid airships became prominent thanks to the zeal of General Umberto Nobile. In 1926 the *Norge,* carrying Nobile, Amundsen, Ellsworth and a crew of thirteen, flew from Spitsbergen across the North Pole to Teller in Alaska, but the flight was followed by an aftermath of bitterness between Amundsen and Nobile. Two years later Nobile's second polar expedition came to a tragic end when the *Italia* was forced down on a wilderness of ice, marooning nine of the crew before disappearing in the Arctic wastes with six men still on board. Search operations, in which several countries participated, claimed more lives, including Nobile's old colleague and rival, Amundsen, before the survivors were rescued. With them came ugly rumours of cannibalism.

In 1930, Britain's R101 burned as it set out for India. The Americans lost the *Akron* in a storm over the Atlantic in 1933; the *Macon* went down in the Pacific in February, 1935, and that was the end

of the big rigid airships in the United States and Britain. Only Dr. Eckener remained to champion the dirigible. Thanks to their long experience in the air the Germans had reduced the weather hazard to a minimum, but they were still dependent on hydrogen and 37 years of experience went up in the flames that consumed the *Hindenburg* in May, 1937.

The era of the great dirigibles has been closed for 20 years, but in other fields the smaller "blimp" still carries on. Mr. Toland's suggestion that "the phoenix that rose from the ashes of the Hindenburg was the blimp" is not quite correct. The "blimp" — the name is said to have originated from a British classification of dirigibles into two types: a. rigid and b. limp — was on the scene in the Great War when it played an active part in the operations of the Royal Naval Air Service. In the years between the wars it was a common sight in American skies, and in the Second World War it was active again in the American Service on anti-submarine patrol. Today the little dirigibles seem destined for the radar picket role; in January of this year a U.S. Navy SPG-2 set a record of 264 hours' continuous flight without refuelling. The rigid airship has passed from the scene, but the "blimp" will be on stage for some time to come.

OTHER BOOKS RECEIVED

This Hallowed Ground. By Bruce Catton. New York, Doubleday, 1956, 437p., $6.75.

Century of Conflict: the struggle between the French and British in Colonial America. By Joseph Lister Rutledge. Toronto, Doubleday, 1956, 530p., $6.00.

The Dead Sea Scriptures. Edited by Theodor H. Gaster. New York, Doubleday, 1956, 350p., $4.50.

The Birth of Civilization in the Near East. By Henri Frankfort. New York, Doubleday Anchor Books, 1956, 142p., $1.00. (Paper back.)

Panic Takes Time. By T. W. Willans. Toronto, Clarke Irwin, 1956, 249p., $3.00.

Egypt's Liberation. By Premier Gamal Abdul Nasser. Washington, Public Affairs Press, 1955, 119p., $2.00.

Mighty Stonewall. By Frank E. Vandiver. New York, McGraw-Hill, 1957, 547p., $7.75.

National Communism and Popular Revolt in Eastern Europe. Edited by Paul E. Zinner. New York, Columbia University Press, 1956, 563p., $3.50.

Berlin. By Theodor Plievier. New York, Doubleday, 1957, 446p., $5.75. (A novel.)

They Fought for the Sky. By Quentin Reynolds. Toronto, Clarke Irwin, 1957, 304p., $4.00.

National Communism and Soviet Strategy. By D. A. Tomasic. Washington, Public Affairs Press, 1957, 222p., $4.00.

The Secret War 1939-1945. By Gerald Pawle. Toronto, Clarke Irwin, 1956, 297p., $3.75.

Air Force: a pictorial history of American air power. By Martin Caidin. Toronto, Clarke Irwin, 1957, 232p., $10.00.

The Ship-Busters: the story of the R.A.F. Torpedo-Bombers. By Ralph Barker. Toronto, Clarke Irwin, 1957, 272p., $3.50.

The Path of Destiny: Canada from the British Conquest to Home Rule 1763-1850. By Thomas H. Raddall. Toronto, Doubleday, 1957, 468p., $6.00.

Readings in Personnel Management: From Fortune. Edited by William M. Fox. Toronto, Geo. J. McLeod, 1957, $2.35.

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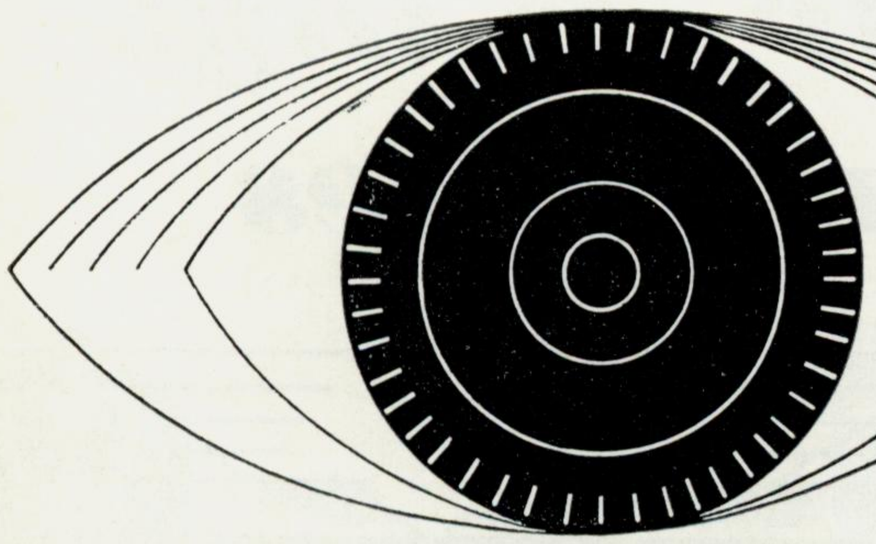
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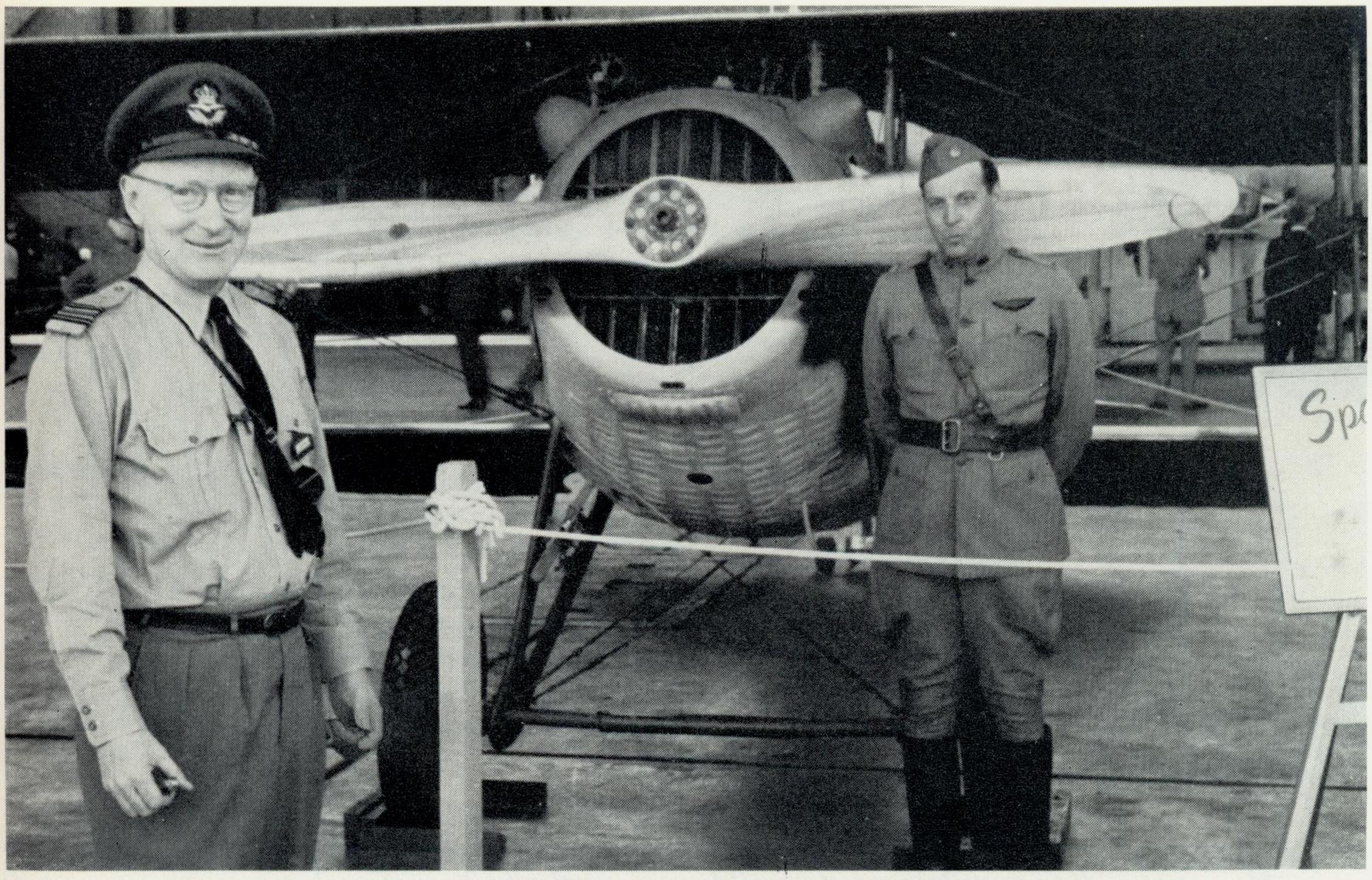
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Biographies

Appointments to the Directing Staff of the Staff College are for a period of three years. During this time members meet and work closely with some 200 senior officers of the RCAF, the RAF, the USAF, the RCN, and the Canadian Army. Montaigne once said, "It is good to rub and polish our brain against that of others". The officers, whose pictures appear below, leave our staff with brains well rubbed and polished to apply their unique experience in dealing with men and ideas to new fields of endeavour.

Marcel's Commanding officer when we met ! Signed the permission for us to get married - Wonderful person !



Group Captain R. L. Denison, D.F.C., C.D.

Richard L. Denison, 39, was brought up in Winnipeg and graduated with a B.A. from the University of Manitoba. He joined the R.C.A.F. immediately after the outbreak of war and, following duty in Canada as a flying instructor and staff officer, went to the Far East and completed an operational tour with a transport squadron in Burma. After the war he commanded the transport support element at the Canadian Joint Air Training Centre at Rivers before coming to the Staff College as a student in 1948. Since that time he has served at Air Force Headquarters in the Directorate of Air Operations, and at Belgrade, Yugoslavia, as Canadian Air Attaché. He leaves the Directing Staff to be Sector Commander, Number 3 Sector, with headquarters at Edgar,

Biographies – Course 21

Valedictory

The Staff College is not likely to make the writing of a valedictory a formal exercise. The suitable, well-turned phrase, the conventional style, and the formal saying of the right thing that marks the valedictory would make such an exercise too easy. The form is too well known. The course ends, the valedictory is written, and good fellowship, relief, and possibly congratulation, prevail.

But surely this is not all. To each of us the Staff College meant something different. The conventional words of thanks and regret that come all too easily cannot possibly express the feeling of each man.

Probably too few of us got the promised ten fruitful months in tranquil surroundings. We were too inclined to be sensitive to criticism of our written work for that. The lofty ideals of the Staff College seemed remote as we wrestled with "Molot", or contrasted the delicate shades of meaning of callipygian and buxom in the heat of "Eureka". Nevertheless, on looking back one can see that every exercise, lecture, visit or discussion formed a desirable or necessary part of the whole. The question is, how well have we assimilated the parts? How successful was the Staff College in carrying out its aim?

Within each student's mind and heart is the answer. The college cannot do more than provide the opportunity for betterment and instil in each of us an aptitude for healthy self criticism. We may disagree with its methods but must admit freely and honestly that our like or dislike and degree of success was a function of our own desire to use the opportunity. It is for providing the opportunity and encouraging our acceptance of it that the College and the Staff deserve our thanks.

SQUADRON LEADER G. A. HECK

Duke works with the Coast Guard Aux. Sea Rescue 1988

Squadron Leader Douglas (Duke) Warren, D.F.C., C.D.

Duke Warren, born in 1922 in Nanton, Alberta, joined the R.C.A.F. on the 14th of March, 1941, and served two tours in Europe on Spitfires. Upon his return to Canada in 1945, he married Melba Bennett, and they have two children. Duke was Officer Commanding, 410 Squadron, R.C.A.F., in the United Kingdom from 1952 to 1954, except for five months in 1953 when he flew with an F-86 U.S.A.F. fighter squadron in Korea. Just prior to attending the R.C.A.F. Staff College, he was with a Fighter Wing of the Air Division in Europe. His next posting is to 1 (Fighter) Operational Training Unit at Chatham, New Brunswick, where he has been appointed Chief Flying Instructor.



Duke & Melba with us in England, Marville, France – Baby-sat the kids in Florenville, Belgium.



Wing Commander H. R. Trepanier, C.D.

Trep Trepanier, born in 1911, is a native of Ottawa, where he attended University before joining the Air Force in 1934. From 1951 until 1953 he filled an exchange position and was Director of the Electronics Division of Air Defence Command Headquarters, U.S.A.F., at Colorado Springs. For some time prior to coming to the College he acted as DEW Line Co-ordinator at Air Force Headquarters. His new job has taken him to 4th Allied Tactical Air Force, Trier, West Germany. In 1943 Trep married Simone Soucy of Hull, Quebec. They have two daughters and a son.



Squadron Leader R. V. Virr, C.D.

Bob Virr, born in 1920, was brought up in Ottawa and attended McGill University for two years. Since then he has had 16 years' R.C.A.F. service, including wartime experience with Coastal Command and with a transport squadron in India. He and his wife, Colleen, were married in 1942 and they have three children. He lists his hobbies as sports in general and fishing in particular. Prior to joining Course 20 Bob worked at logistics planning at Air Force Headquarters. He left Armour Heights to join — after jet conversion training — the Air Division in Europe.



Squadron Leader Thomas Wallnutt, A.F.C., C.D.

Tom Wallnutt was born in Vancouver in 1916 and joined the R.C.A.F. in 1940. Three years later he married Dorothy MacLatchy, of Toronto, and today they have three children. During the war he served with Training Command and was one of the original three R.C.A.F. officers to hold an "A1" instructor's category in the postwar air force. His service includes a stint as adjutant at Staff College, and a tour as Senior Support Officer at 420 (F) Squadron (Auxiliary), London, after which he returned to the Staff College as a student. Tom is now with the Directorate of Flight Safety at Air Force Headquarters.

Squadron Leader D. G. Bell-Irving, C.D.

Gordon Bell-Irving was brought up in Vancouver and educated there and at Royal Military College, Kingston. After training as a pilot and serving as a flying instructor, he joined a night interdiction squadron early in 1944 and flew Mosquitoes from bases in the south of England. He was mentioned in dispatches in connection with this work. Following the war he served with the regular force support sections of 400 (Fighter) Squadron, Toronto, and 2442 Aircraft Control and Warning Unit, Vancouver. He was also on the staff at 12 Group Headquarters, Vancouver, and Air Defence Command Headquarters, St. Hubert. He became a student at the Staff College in 1954, and after completing the course, joined the Directing Staff. One of his duties at the College has been the editing of this Journal. Gordon is married to the former Mary McDonald, of Banff and Ottawa, and they have three children. The Bell-Irvings have moved to Ottawa where Gordon is with the Directorate of Joint and Combined Planning at Air Force Headquarters.



Gordon & Daddy flew Sabres to flights
west to keep up flying time. Many
and I great friends in Ottawa.



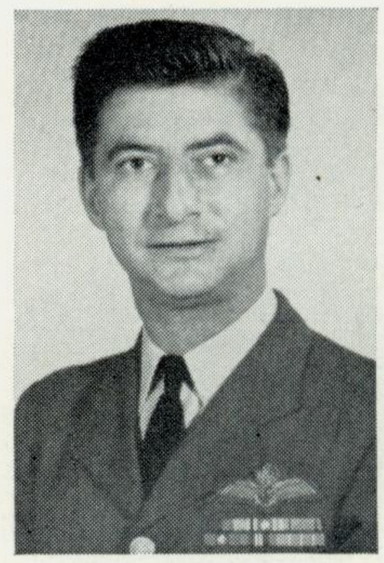
Major C. R. Balfour, C.D.

Rory Balfour, born in 1918, is a native of Cornerbrook, Newfoundland. He joined the Royal Regiment of Canadian Artillery in 1939 and served overseas as a regimental officer until 1945. His post-war experience includes staff and instructional appointments; he graduated from the Canadian Army Staff College in 1952. More recently he was the Deputy-Assistant Adjutant and Quartermaster-General at Headquarters Anti-Aircraft Command. His new job has taken him to Washington as a member of the Canadian Joint Staff. Rory is married to the former Jean L. Morey of Cornerbrook, Newfoundland, and they have two sons.



Squadron Leader R. J. Bayne, D.F.C., C.D.

Robert Bayne was born in 1918 in Montreal. In August 1940 he first joined the Canadian Army but later switched over to the Air Force. Bob had a particularly distinguished career during the war; as an air observer he completed two tours with Bomber Command, mainly with 405 Squadron in the Pathfinder Force, and gained the D.F.C. and Bar. After the war he worked for many years in Intelligence, on exchange duties in Washington, D.C., and later at the main office in Ottawa where he came to occupy the important position of A.I.2., He is now the R.C.A.F. representative in the Military Studies Department at the Royal Military College. Bob is married to the former June Mary McCann of Ottawa. The Baynes have three children.



Squadron Leader M. J. H. M. Belleau, C.D.

Marcel Belleau, 39, was born and educated in Montreal and joined the R.C.A.F. in 1940 to train as a pilot. Most of his wartime service was spent with the Desert Air Force and the Free French Air Force on fighter operations. Following the war Marcel flew with Transport Command and 414 Photo Squadron, became Chief Administrative Officer at R.C.A.F. Station Bagotville, and in the three years before coming to the Staff College, served as Officer Commanding 439 (Fighter) Squadron in England and France. Accompanied by his wife, the former Doreen Cooke of Winnipeg, whom he married in 1947, Marcel is now in Ottawa where he has taken up an appointment with the Directorate of Air Plans Strategic.

"Best wishes"
Marcel
Doreen



Squadron Leader J. H. C. Boby, C.D.

John Boby, 37, was born in Lincoln, N.B. His father was a member of the R.C.M.P., so John's education was gathered in many schools. He graduated from high school at Campbellton, N.B., and joined the R.C.A.F. on 13 September, 1940. After training as a navigator he served for two tours of operations with Coastal Command. Since the war he has obtained a triple observer rating with navigator, radio officer, and airborne intercept officer qualifications. Before joining Course 21 he was Chief Instructor of the Applied Navigation School at Winnipeg. On graduating from the Staff College he was transferred to Air Defence Command to become a member of an all-weather squadron. In 1951 John married Clara Perkins of Ottawa. They have two children.



Squadron Leader G. H. Booth, C.D.

Harry Booth, 39, was born in Suffield and educated in Calgary. He enlisted in the R.C.A.F. in 1940 as an observer and flew on operations with the R.A.F. in the United Kingdom and the Middle East. After a year of civilian life following the war he rejoined the R.C.A.F. and since 1946 has served with the Directorate of Air Intelligence, performed search and rescue duties at R.C.A.F. Station Greenwood, and acted as Executive Assistant to the Air Officer Commanding, Maritime Air Command, and Commanding Officer of the R.C.A.F. Recruiting Unit, Winnipeg. Harry married Gertrude Emillie Traversy of Ottawa and Toronto. With their three sons the Booths have moved to Ottawa where Harry once again serves in the Directorate of Air Intelligence.

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Squadron Leader J. W. Borden, D.F.C., C.D.

Jim Borden was born in Wiarton in 1921 and educated in Stratford. He transferred to the R.C.A.F. from the Army in 1941 and during the war completed operational tours with 2 Group and the Desert Air Force of the R.A.F. Subsequently he served with the Winter Experimental Establishment and flew on the Korean Airlift with Air Transport Command. From 1950 to 1952 Jim served on exchange duties with the R.A.F. Transport Command and took part in the Transport Command operations in the Suez Zone during the Egyptian crisis of 1950. In 1944 he married Marguerite Cook of Salisbury, England; they have one son and one daughter. Jim is the Officer Commanding 121 Communications and Rescue Flight, Sea Island, B.C.



Squadron Leader W. J. Bracken, D.F.C., C.D.

Bill Bracken, 36, was raised on a farm near Kingston, Ont. His education was interrupted by the war but he re-entered Queen's in 1945 and graduated in 1948 with a B.Sc. in Civil Engineering. Bill entered the R.C.A.F. in 1940 and served overseas on fighter and photo reconnaissance squadrons for three and a half years. He rejoined the R.C.A.F. in 1948 and has since been employed in construction engineering work. He is now a staff officer at Air Force Headquarters in the Construction Engineering Branch. Squadron Leader Bracken married Miriam Nicholson of Summerside in 1949. They have three daughters.



Wing Commander H. E. Bridges, D.F.C., C.D.

Born in Toronto in 1921, Harold Bridges completed his formal education in that city before joining the R.C.A.F. in 1941. His experience during the war included tours as a flying instructor, a bomber command pilot and a staff officer in 6 Group. Since the war he has held staff jobs at Training Command Headquarters, at Air Force Headquarters and at S.H.A.P.E. Hal has an extensive knowledge of N.A.T.O. and the U.N. He and his wife, Elizabeth, have three children, and they are all looking forward to resuming family life when Hal completes his all-weather fighter training.



Wing Commander J. N. Brough, C.D.

Norris Brough was born at Haileybury, Ont., in 1911, and attended Bishop's University, Lennoxville, where he obtained his B.A. degree in 1930. His formal education also includes a two-year post-graduate course in aeronautical engineering at the U.S.A.F. Air University Institute of Technology. Norris joined the R.C.A.F. as an aeronautical engineer in 1942. His appointment prior to attending the Staff College was Officer Commanding the R.C.A.F. Technical Services Detachment at A. V. Roe Canada Ltd. Norris and his wife, Mary, have two sons. In his present assignment with Central Experimental and Proving Establishment Norris is putting to use his bent for development work.



Lieutenant Colonel G. S. Brown, U.S.A.F.

Gerald Brown was born in 1921 in Rockville, Missouri. He entered the U.S.A.F. less than one month after Pearl Harbour. Gerry did a combat tour on B-24's in the Mediterranean Theatre and was later Operations Officer of a B-24 Bomber Group. On returning to the United States he became Liaison Officer to the Manhattan Project in Albuquerque, New Mexico, and was later Base Operations Officer in Albuquerque. It was there he met his wife, the former Gertrude Wilson. The Browns have two children. Before coming to the Staff College Gerry was Chief of the War Plans Division of Air Training Command. He is now with the 32nd Air Division, Syracuse, N.Y.

Squadron Leader J. T. Dalton, C.D.



Terry Dalton, 36, was born in Newcastle, New Brunswick. He joined the R.C.A.F. in 1943, after a short period in the Army, and served until release in September 1945. Terry re-entered the University of New Brunswick and graduated with a B.Sc. in Electrical Engineering in 1946. He re-enlisted in the R.C.A.F. in 1947. Terry has held several flying appointments, was on the staff of Air Radio Officer School, Clinton, and was Resident Staff Officer with the University of New Brunswick Squadron. Before he joined Course 22 he was at Training Command Headquarters in Postings and Careers. Terry married Dorothy Martin in 1946 and they have five sons. He is now on the staff of 2 Air Observer School at Winnipeg.

Squadron Leader W. S. Day, D.F.C., C.D.



Bill Day was born in Aylesford, N.S., in 1921. He joined the R.C.A.F. in 1940 and, after training as a pilot, instructed at Brandon, Man. He went overseas in 1942 and completed a tour of operations in Bomber Command. Later he was a flight commander at an Operational Training Unit and on 436 (T) Squadron. His post-war assignments have included a tour with 414 Photo Squadron and duty at A.M.C.J.S. London. Before coming to Staff College Bill was Chief Operations Staff Officer at R.C.A.F. Station Greenwood; at present he is in the Directorate of Air Operations at A.F.H.Q. In 1946 Bill married the former Audrey Adams, of Leamington Spa, England. They have three children.

Bill and Marcel on Photo Squadron together. Audrey and I close friends - in Nova Scotia. 1988. Bill Lee Altzheimers - Audrey & he in Nova Scotia.
(over)

Wing Commander G. L. Burness, C.D.



Gordon Burness, born in 1916 in Wadena, Saskatchewan, joined the R.C.A.F. in 1937. Three years later he was commissioned in the Supply Branch. He was overseas from July, 1942 to May, 1946, and the end of the war saw him Commanding Officer of 406 Air Stores Park at 2nd Tactical Air Force. Before coming to the Staff College Gordon served at Air Force Headquarters. The precise designation of his job is something of a gem: AFHQ/AMTS/CMat/DMS/MS-3. He has gone from here to another imposingly lettered job, this time with Air Materiel Headquarters. The Burnesses (Mrs. Burness is the former Pearl Runnels of Richmond, Indiana) have two children, both boys.

Squadron Leader J. H. Cooper, D.F.C., C.D.



John Cooper, 38, was born and educated in Qu'Appelle, Saskatchewan. He joined the R.C.A.F. as a pilot in 1940 and, after a tour of instructional duty at Yorkton, proceeded overseas where he joined a bomber squadron. Shot down near Caen in July, 1944, he was a prisoner until the end of the war. After the war he was employed in various flying training duties and served for two years at Headquarters, Strategic Air Command, U.S.A.F. Before going to the Staff College he was employed in the Operational Requirements Branch at Air Force Headquarters, and after finishing the course he returned to Ottawa to serve under the Chief of Plans. In 1951 John married Flight Lieutenant Doris Park, the matron of the Station Trenton Hospital; they have one child.

Squadron Leader J. G. Corrigan, D.F.C., C.D.



John Corrigan, 34, was born in Ottawa, and educated at St. Thomas Acquinas Separate School and at the Ottawa Technical High School. He joined the R.C.A.F. in April, 1942. All of his wartime experience was with the Pathfinder Force of the R.A.F., and he completed three tours of operations. After the war John was aide to the Air Officer Commanding Eastern Air Command. Later, he was employed in staff positions at Northwest Air Command and Training Command Headquarters. Before coming to the College, John spent three years as Chief Navigation Instructor at the R.C.A.F. Central Navigation School, and after graduating he was transferred to Air Defence Command to join an all-weather squadron. John married Lucy Yarn of Halifax in 1946. They have two daughters.

Squadron Leader L. H. Croft, C.D.



Laurie Croft was born in Saskatchewan in 1920 and received his secondary schooling in Manitoba. After working for a number of years in a Manitoba bank he joined the R.C.A.F. in June of 1941. His wartime service was with Coastal Command. After stints at Winnipeg and Ottawa he returned to maritime work and served as a pilot with 405 (M) Squadron at Station Greenwood, and as the pilot member of the Air Staff Team at Maritime Air Command Headquarters. Laurie married the former Mary Imrie of Herbert, Saskatchewan. They have three sons. Laurie is now in Ottawa with the Directorate of Transport and Maritime Operations at Air Force Headquarters.

Squadron Leader G. G. Daw, C.D.



Geoff Daw was born in Yorkshire in 1923 and received his early education at one of its older schools. In 1939 he became an R.A.F. apprentice (a "Trenchard Brat") and served with the R.A.F. until July of 1946. Early in 1948 Geoff came to Canada; he joined the R.C.A.F. in November of that year. In the two air forces his experience includes maintenance, salvage, quality control, and staff work. He holds a Master's Degree in engineering from McGill University. His wife is the former Grace Baird of Toronto; they have three daughters. Geoff's last appointment before coming to the Staff College was Officer Commanding 10 Technical Services Unit, Calgary. He now serves with 11 Technical Services Unit in Montreal.



Squadron Leader F. W. Evans, D.F.C., C.D.

Fred Evans, 38, was born and educated in Saint John, New Brunswick. During the Second World War, Fred flew "Spitfires" on operations with 421 Squadron. Since the war he has had various flying appointments, including duty with the R.A.F. and the U.S.A.F. While with the U.S.A.F. he was attached to a Sabre Squadron on operations in Korea. Since then he has held staff appointments at 1 Air Division Headquarters and at A.F.H.Q. It was from this latter post that he came to the Staff College. Fred is married to the former Claire Dunlop, of Ottawa. They and their two children are now living in Colorado Springs, where Fred is on the staff of NORAD.



Squadron Leader A. W. Fisher, C.D.

Art Fisher was born in 1918 in Saskatchewan and attained his matriculation there. He enlisted in the R.C.A.F. as an airframe mechanic in 1938. In 1942 he remustered to aircrew and became a pilot. Most of Art's flying career has been associated with Training Command; he has served on the staffs of Flying Instructors School, Instrument School, and Central Flying School. Before he came to Staff College, Art was in Europe; he commanded Sabre Squadrons in England, Germany and France. At present he is on the staff of the Officers Postings and Careers Branch in Training Command Headquarters. Art and his wife, Terry, have three children, a son and two daughters.

Art flew with #39 Squadron when Dad was S/O in England & France.



Wing Commander G. T. Doucet, C.D.

Gerry Doucet was born in North Battleford, Saskatchewan, on 20 July, 1913, but was raised in Vancouver, which he considers his home. In 1935 he enlisted in the Logistics Branch of the R.C.A.F. and he has, since then, become an expert in that field. During the Second World War and for the past ten years he has acted as chairman of provisioning conferences in Canada, the U.S.A., and the U.K. Married to Margaret Dempster of Edmonton and Vancouver, he is the father of two sons and two daughters.



Wing Commander W. L. Drake, C.D.

Smokey Drake, who has been in the R.C.A.F. since 1940, comes from Kingston, Ontario, where he was born in 1919. He married on 2nd December, 1950, Georgette Vance of Garden City, N.J.; they have one daughter. Before coming to Staff College, Smokey was employed as Staff Officer, Plans and Requirements, Air Defence Command, and prior to that as Staff Officer, Operations, at 1 Air Division. His hobbies are sailing, skiing, and shooting. Smokey is currently going through the refresher training mill prior to taking over an all-weather fighter squadron in Air Defence Command.



Wing Commander A. C. Bowes

Al Bowes, born in 1920 and a native of Golden Lake, Ontario, is a specialist in airborne telecommunications systems. Before coming to the College he served as the Director of Airborne Telecommunications at Air Force Headquarters and was Station Telecommunications Officer at Goose Bay. He left the College to be Staff Officer, Telecommunications, with 1 Air Division Headquarters in Metz, France. Al and his wife, Pegge, have three children.

Squadron Leader J. D. W. Campbell, D.F.C., C.D.

Jack Campbell was born in 1920 in Dartmouth, N.S. and joined the R.C.A.F. as aircrew on 10 September 1940. He flew two tours overseas with Coastal Command on anti-shipping strikes and in March, 1943, he married Edna Knight of Sevenoakes, Kent, a W.A.A.F. officer. They have three sons. Jack came to Staff College by way of Training Command Headquarters where he spent five years with the Air Training and the Personnel staffs. Following graduation from Staff College Squadron Leader Campbell is returning to flying duties, this time on CF-100s.





Wing Commander K. C. M. Dobbin, C.D.

Kenneth Dobbin was born in 1921 in Lindsay, Ont., and joined the R.C.A.F. in September, 1940. He started his aircrew career as an air observer on Catalinas of Coastal Command; remustered in 1942 to pilot; and then did half an operational tour with 78 Squadron, R.A.F., of 4 Group, and another half tour on special duties with 148 Squadron, R.A.F., in Italy. Before coming to the Staff College Ken was Commanding Officer of 4 (Transport) Operational Training Unit in Trenton. He has gone to the Directorate of Flying Safety at Air Force Headquarters. The Dobbins (Mrs. Dobbin is the former Dorothy Hockey of Toronto) have one boy and three girls.



Squadron Leader A. R. Durston, C.D.

Allan Durston was born in 1918 in Boisevin, Manitoba, but Dauphin, Manitoba, is his home. He has been in the R.C.A.F. since July, 1941. During the war he instructed for a long time on twin engine aircraft and it was only in 1944 that he was posted to a general reconnaissance course and from there to a flying boat Operational Training Unit. Al's appointment before he came to the Staff College was personal staff officer to the Chief of the Air Staff. He went from the College to 1 Air Division Headquarters in Metz, France, where he is now working in the Plans and Organization Branch. Al is married to the former Anne Wellman of his home town, Dauphin. They have two daughters.



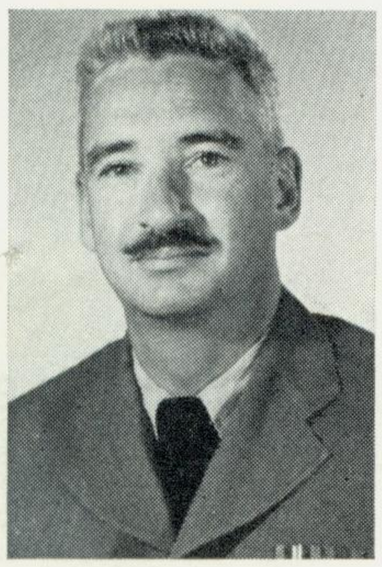
Wing Commander D. C. Evans, D.F.C., C.D.

Although Cliff Evans was born in Bury St. Edmunds, Suffolk, England, in 1915, he was brought up and educated in Okotoks, Alberta. He joined the R.C.A.F. in 1941 as an observer, and completed a tour of operations with Bomber Command. Since 1945 Cliff has been employed in a variety of positions ranging from Commanding Officer at Kittigazuit to being a member of the Privy Council Secretariat in Ottawa. He came to the Staff College after four years in the Directorate of Postings and Careers. He married Ellen Bice of Vancouver in 1940. They have two children. Cliff is the Officer Commanding of 2 Air Observer School in Winnipeg.



Squadron Leader W. W. Fox, C.D.

Bill Fox, 37, comes from Toronto, where he obtained his Senior Matriculation at Scarborough Collegiate Institute. During his sixteen years of service with the R.C.A.F. Bill has had a wide variety of operational experience on three continents including coastal operations from Alaska, transport and paradrop missions over Europe and a six month fighter tour with a U.S.A.F. Sabre squadron in Korea. Before he went to Korea he was a gunnery and fighter instructor at Chatham, and immediately before attending the Staff College he enjoyed a two year exchange posting at the Air Ministry in London. Bill and his wife, Jean, who served with the R.C.A.F. as a nursing sister, are the parents of two sons. Bill is now holding a staff appointment at Air Defence Command Headquarters.



Wing Commander I. Gillean

Ian Gillean, 38, was born in Montreal and graduated from McGill University in Electrical Engineering in 1940. Ian served as an Education Officer during the war and left the Air Force in 1945 to work as a development engineer in the Canadian Marconi Company. After rejoining in 1948 as a telecommunications officer he served at Air Materiel Command Headquarters and was later seconded to D.N.D. Inspection Services. A bachelor during his training at the Staff College, Ian is now home again in Ottawa with his wife, the former Maybird Wright of Montreal, and their three children. He is on the staff of the Senior Telecommunications Staff Officer at Air Materiel Command Headquarters.



Squadron Leader N. G. Gordon, D.F.C., C.D.

Doc Gordon, 39, was born in Halifax, where he received his secondary schooling and commercial training. He enlisted in the R.C.A.F. in 1939 and remustered to aircrew three years later. He returned to Canada in May, 1945 after a two-year tour in the European Theatre. Since then he has served on a communications flight, as a station adjutant, and as a member of 404 and 407 Maritime Squadrons. He was married to Llowyin Frances Farrelly of Winnipeg in 1946. They have two girls and a boy. Doc finds himself very much at home in Halifax where he is Staff Officer Organization at Maritime Air Command Headquarters.



Squadron Leader G. A. Heck

Bud Heck, the youngest member of Course 21, was born in 1925 in Stettler, Alberta. He attended school in Alberta until the war interrupted his education and then returned to school after the war, graduating with a B.Sc. from the University of Alberta. Since the war he has spent most of his time on test and development work; he has taken the course at the Empire Test Pilots' School in the United Kingdom and completed two tours of duty with Central Experimental and Proving Establishment. Bud is married to the former Irene Pickering of London, England and they have one son. Bud is now working at Air Force Headquarters in the operational requirements field.



Squadron Leader J. M. Hempstock, C.D.

Jim Hempstock was born near Ericson, Manitoba, but grew up and was educated in Souris, which he considers his home town. He enlisted in the R.C.A.F. in 1939 but later remustered and graduated as an observer in 1943. During the Second World War he served with a bomber-reconnaissance squadron on the West Coast of Canada and also completed a tour of transport operations in Burma. For the three years prior to his arrival at the Staff College he filled the position of Staff Officer Training at Air Transport Command. Married in 1940, Jim and his wife, Mae, have one daughter who is ten years old. At present, he is employed on the staff of Central Flying School at Trenton.



Wing Commander H. K. Hollingsworth, C.D.

Holly Hollingsworth was born in Athens, Ontario in 1914. He is a graduate of the University of Toronto and was an instructor at Central Technical School, Toronto when he enlisted in the R.C.A.F. He served as a navigator in Coastal Command during the war. Afterwards he transferred to the Armament Branch and completed the Advanced Armament course in the United Kingdom. Since then he has served in the Directorate of Armament Development at Air Force Headquarters and at the Canadian Joint Staff, Washington. Holly married the former Florence Hampton of Glasgow, Scotland in 1944 and they have two boys and one girl. Holly is now serving in the Directorate of Armament Engineering at Air Force Headquarters.



Major W. G. Hudson, U.S.A.F.

Skeeter Hudson comes from Selma, Alabama, and is a graduate of the Alabama Polytechnic Institute (Agricultural Administration). During the war, he piloted Liberators in the South-West Pacific. In 1950, Skeeter was operations officer of the first fighter squadron to participate in the Korean action and was credited with the first aerial victory. Before coming to the College, he and his wife, Dolores, were stationed at Eglin Air Force Base, Florida, where Skeeter was a test pilot and project officer on all-weather fighter tests which included the Convair F-102. Skeeter is now serving at Eastern Air Defence Command Headquarters, Stewart Air Force Base, New York.

"Dolores + Skeeter" Our pals at Staff



Squadron Leader A. R. Jobson, C.D.

Art Jobson, born in 1917, was brought up in Ottawa, and has been in the R.C.A.F. since 1939. He has held various positions in the supply organization, and was with Supply Administration at Air Force Headquarters before coming to the Staff College. Art is also a qualified Explosives Officer, and he was Commanding Officer of 15 "X" Depot, at Kamloops, for three years. He took his training in explosives in the United Kingdom and the U.S.A. Art and his wife, the former Anita Sands of Ottawa, have one child. Squadron Leader Jobson has been chosen to be Liaison Officer with the Royal Helenic Air Force at Athens, Greece.



Squadron Leader J. E. L. John, D.F.C., C.D.

Jimmy John was born and educated in Victoria, B.C. and served overseas with R.A.F. Bomber Command during the war. Afterwards he held staff and operational appointments on the West Coast, was an instructor and Command Instrument Check Pilot at Instrument Flying School, Centralia, and just prior to entering the Staff College, was Staff Officer Flight Safety at Training Command Headquarters, Trenton. Jimmy and his wife, the former Nina Dockerill, and their two-year-old daughter have moved to Ottawa where Jimmy has taken up his new appointment in the Directorate of Postings and Careers.



Squadron Leader D. C. Laubman, D.F.C., C.D.

Don Laubman was born in 1921 in Alberta and attained his matriculation there. He enlisted in the R.C.A.F. in September, 1940 and aside from training and a short instructional tour, spent all his time with fighter squadrons. Since the war Don has served with both Auxiliary and Regular squadrons, and as a staff officer with 1 Air Division Headquarters in France. Married in 1946 to Margaret Gibson of Calgary he is the father of two children. Before coming to the Staff College he worked in the Operational Requirements Branch at Air Force Headquarters; he is now enjoying life in Washington, D.C., where he is with the Canadian Joint Staff.



Squadron Leader N. Levitin, D.F.C., C.D.

Nat Levitin, born in 1917, and a native of Ottawa, joined the Post Office Department in 1935. In 1938 he started an extramural course at Queen's University which he continued intramurally after his wartime service with the R.C.A.F., graduating in 1947 as a B.Comm. In 1940 he joined the R.C.A.F., and as a navigator flew two tours of operations with Coastal Command. His post-war duties have included a tour with 413 Photo Squadron, and a tour at Air Force Headquarters in navigation instrument development. His wife, Mirian, and their three daughters remained in Ottawa while he was on course, and Nat has now rejoined them and is serving in the Directorate of Air Intelligence.



Wing Commander J. D. Lindsay, D.F.C., C.D.

Doug Lindsay was born in Arnprior, Ont., in 1922. He joined the Air Force in 1940 and after training as a pilot, instructed for a short time on Harvards. He went to England in 1943 and fought as a fighter pilot and a flight commander until, at the age of 22, he became Officer Commanding of 421 R.C.A.F. Squadron. His assignments before coming to the Staff College were Chief Operations Officer of 1 Wing in North Luffenham, England, and Staff Officer Operations, 1 Air Division in Metz. At present he is serving in the Directorate of Air Operations at Air Force Headquarters. Doug is married to the former Dorothy A. Whelan of Ottawa and they have three children.

Squadron Leader J. T. Lloyd, C.D.



Jack Lloyd was born in Vancouver in 1919 and attended the University of Saskatchewan before joining the R.C.A.F. in 1942. A navigator (air/obs.), he spent the first part of his career as an instructor at St. Johns, Que., and then completed his wartime flying on Liberators in Coastal Command. Afterwards, in peacetime, he was with Air Transport Command for seven years on northern photo operations, on transport work, and at Headquarters in operations. Before coming to Armour Heights he was the Resident Staff Officer at McGill University. He is now the Staff Officer Organization at 1 Air Division Headquarters. Jack and his wife, Reta, have two children and now call Edmonton their home.

Wing Commander R. H. Manson, A.F.C., C.D.



Russ Manson was born in St. Boniface, Manitoba, in 1921, and received his secondary schooling at Norwood Collegiate Institute. He joined the R.C.A.F. in October of 1940 and completed a tour on Hampden bombers in the European Theatre. His last appointment before attending Staff College was Officer Commanding 3 Flying Training School. He is married to the former Bernice Macdonald; they have two sons. As his special qualification lies in the pilot-training field his success in his new position in Ottawa with the Directorate of Air Training should be assured.

Squadron Leader B. H. Marfleet, C.D.



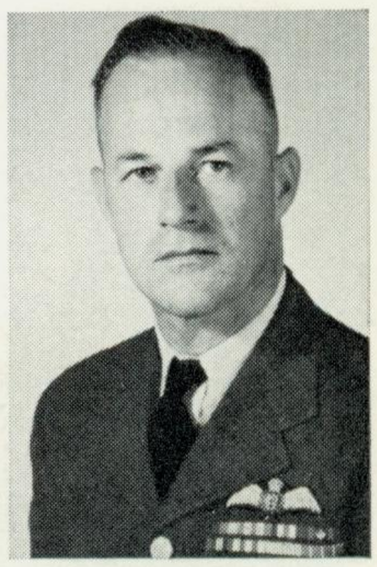
Brian Marfleet, 41, was born in Marwayne, Alberta. He graduated from high school in 1938 and shortly afterwards joined the R.C.A.F. as a supply technician. In 1942 he remustered to aircrew and became a pilot. Most of Brian's career has been associated with Training Command, where he has served in nearly all phases of air training, including Central Flying School. Before coming to the Staff College he was Chief Flying Instructor at 3 Advanced Flying School, Gimli. After graduating he became a staff officer in the Air Training Branch at Training Command Headquarters. Brian and his wife, Edna, are the parents of two boys and two girls.

Squadron Leader G. A. Martin, R.A.F.



George Martin, one of the two R.A.F. officers on Course 21, was born at Ebbw Vale, Monmouthshire, in April, 1921. George joined the R.A.F. in 1941 and served three tours in the Middle East as a pilot on night intruders, day fighter and ground attack aircraft. His experience since the war has been mainly with fighters, and his assignment prior to attending Staff College was as a staff officer at Fighter Command Headquarters. George is a graduate of the Day Fighter Leader School and a qualified Flying Instructor and Pilot Attack Instructor. He and his wife, Mona, have one daughter, Lesley Anne. George has returned to the United Kingdom; his Welsh wit will be missed by his Staff College friends.

Squadron Leader J. P. McDonald, C.D.



Pat McDonald was born in 1920 at Vancouver, B.C. He joined the R.C.A.F. in 1941 and has served almost continuously with Air Transport Command. Subsequent to flying, he held administrative posts at unit and command level. As a transport pilot, he flew two Governors General and two Prime Ministers. Before he went to the Staff College he was Chief Instructor, Land/Air Warfare (Transport) at the Canadian Joint Air Training Centre, Rivers, where he served on N.A.T.O. and A.B.C. Standardization Committees. Pat married Edna Pike at Biggin Hill, Kent, in February, 1946. They have three children, two girls and a boy. Pat is now Resident Staff Officer with the University of Toronto Squadron.



Wing Commander W. M. Mills, C.D.
Born in Toronto in 1915, Bill Mills moved to the west coast in 1929. He completed his formal education in Victoria, B.C., where he attended Victoria College (UBC) and Victoria Normal School. Enlisting in the Royal Canadian Army Pay Corps in 1939, he transferred to the R.C.A.F. in 1940 as an accountant officer. In this capacity he has served at various training units, at Command Headquarters and, for the three years before going to the Staff College, in the Directorate of Accounting at Air Force Headquarters. In 1939, he married Mimi Langley of Victoria, and they now are the parents of two daughters. Bill's present assignment is with the Comptroller Division at Air Force Headquarters.



Squadron Leader R. G. Murray, A.F.C., C.D.
Gordon Murray, 38, was born and raised in Saskatoon, and left the University of Saskatchewan to join the R.C.A.F. in June, 1940. His wartime service included a tour of operations in North Africa, where he flew Wellington and Liberator aircraft, and an instructional tour at the Greenwood, N.S. Operational Training Unit. Following the war he spent a year in Alaska with a U.S.A.F. B-29 Polar Reconnaissance Squadron. Before coming to the Staff College he was Staff Officer Training at Tactical Air Command Headquarters; his next assignment will be with a Sabre Squadron in Europe. Gordie is married to the former Helen Phinney of Middleton, N.S. They have three children.



Squadron Leader L. L. Nault, C.D.
Louis Nault was born in Maniwaki, Quebec, in 1920, and enlisted in the R.C.A.F. in 1938. He went overseas as an air gunner in 1940 and completed an operational tour on night intruders. Lou married Marcella O'Leary in London in 1942 before he returned to Canada for pilot training. He returned to Europe and completed one tour on day fighters before the end of the Second World War. Just prior to his transfer to Staff College, he served as weapons specialist at Training Command Headquarters. He is bilingual, and a keen enthusiast of hunting, fishing, and golfing. Squadron Leader Nault is now with the Directorate of Air Defence Requirements at Air Force Headquarters.



Squadron Leader L. C. Olien, C.D.
Olie Olien, 38, and a native of Winnipeg, joined the R.C.A.F. in 1940 and departed for England early in 1941. He became one of the original aircrew members of 419 Bomber Squadron, and served as radio officer to the late Wing Commander Moose Fulton. Since the war, Olie has been active in the recruiting field and has held a variety of positions connected with observer training. Just before coming to Staff College, he was Officer Commanding the Basic Observer School at Winnipeg. Olie and his wife, the former Betty Colancy, have three sons. Squadron Leader Olien will be spending the next few years in the Directorate of Air Intelligence in Ottawa.



Squadron Leader H. Peters, C.D.
Hugh Peters, born in 1923 and a native of East Coulee, Alberta, is a specialist in photography. After joining the R.C.A.F. in 1942, he served as a navigator in coastal and transport operations. Following the war, Hugh graduated from the University of British Columbia (B.A.) and re-enrolled in the R.C.A.F. in 1948. Before coming to the College, he served at Air Transport Headquarters with Photographic Operations and the planning staff. Hugh married Beverley Lorraine Vaughan of North Vancouver in 1948, and with their three daughters they now live in Ottawa where Hugh is working in the Directorate of Air Equipment Engineering.

Squadron Leader O. B. Philp, D.F.C., C.D.



"O.B." Philp, 33, comes from Vancouver, B.C. In 1942, while attending the University of Manitoba, he joined the R.C.A.F. and late in 1943 was transferred overseas to serve in the United Kingdom, Burma and Europe. Returning to Canada in 1946 O.B. was employed on flying and administration duties until 1951, when he attended the Empire Test Pilots School at Farnborough, England. Before going to the Staff College he was Chief Test Pilot at Central Experimental and Proving Establishment. He is married to the former Maeve Armour of Vancouver, and they have two children. Squadron Leader Philp is now serving at Air Force Headquarters in the Directorate of Flight Safety.

Wing Commander E. W. Pierce, C.D.



Ellery Pierce, 38, was born in Almonte, Ontario, and completed his education in Banff, Alta. He enlisted in the R.C.A.F. at Vancouver in 1937 as a Wireless Technician and was commissioned in 1943. He remustered to aircrew as a Navigator (W) a year later. Ellery transferred back to the Telecommunications Branch at the end of the war and served in staff positions for four years at Air Force Headquarters, two years at 10 Repair Depot, and four years at Air Materiel Command Headquarters. He married the former Gladys Stewart of Vancouver in 1940, and they have two daughters and one son. Ellery is now serving in the Telecommunications Division in S.H.A.P.E. Headquarters, France.

Squadron Leader R. M. Porter, C.D.



Ross Porter, 34, was born in Ottawa, Ontario, and educated in Washington, D.C. During the war he served in R.A.F. and R.C.A.F. units of Bomber Command as an Air Gunner, and from 1944 to 1948 he held a number of staff positions connected with air transport. In 1949 Ross graduated as a pilot and flew with a Search and Rescue unit on the west coast until 1951. From then until he went to the Staff College he held positions on Intelligence staffs in Ottawa and the United Kingdom. In 1942 he married Margaret Mellor of Macclesfield, Cheshire; they have two daughters. At present he is Chief Administrative Officer at Bagotville.

Squadron Leader A. A. Proctor, A.F.C., C.D.



Bert Proctor, 39, was born and educated in Winnipeg, Manitoba. Following four years of service with the Royal Canadian Artillery (NPAM), he enlisted in the R.C.A.F. in 1940. After graduating as a pilot he filled a variety of positions connected with pilot training and did a trip with 45 Atlantic Transport Group. Before coming to the Staff College, Bert was employed in the Organization Branch at Air Materiel Command. He and his wife, Lorraine, have three children, a son and two daughters. His current job is Chief Administrative Officer at 6 Repair Depot.

Squadron Leader N. A. Rutherford



Al Rutherford was born in Toronto in 1917, and after graduating in Mathematics and Physics from the University of Toronto he taught those subjects in the Collegiate Institute of Barrie, Ont. He spent three war years instructing at Air Observer Schools. After serving in England and on the Continent with 437 Transport Squadron he returned to the teaching profession in 1946. In 1948 he rejoined the R.C.A.F. in the Education Branch, and at the time he was posted to the Staff College he was Command Education Officer in Air Materiel Command. He is now in the Directorate of Ground Training at Air Force Headquarters. In 1943 he married Elsie Vant of Winnipeg, and they have two daughters.



Wing Commander C. F. Sanford, C.D.

Sandy Sanford was born in Summerville, N.S., in 1922 and joined the R.C.A.F. in 1940. Most of his wartime service was spent on coastal patrol work, operating from some of the more remote points on the east coast of Canada. Since that time he has done a good deal of flying with Air Transport Command, served as Chief Administrative Officer of 5 Supply Depot at Moncton, and as Executive Assistant to the Air Officer Commanding Training Command. He was Staff Officer Operations at Air Transport Command Headquarters before coming to the College, and he is now Senior Air Staff Officer at that same Headquarters. Sandy was married in 1948, and he and his wife, Jean, have two daughters.



Squadron Leader J. D. Shaw, C.D.

Jack Shaw was born in Swan River, Manitoba, in 1919, and has spent the past 16 years in the R.C.A.F. His original aim in life was to become an agricultural expert, so he studied for his B.S.A. degree at the University of Manitoba, graduating in 1941. At this point, however, he was diverted from his aim and he spent the next eleven years learning to fly himself and to train others. For the past few years he has served on the personnel staff at Air Defence Command Headquarters, St. Hubert, Quebec. Jack and his wife, Enid, have four children. Jack now fills an exchange position with the U.S.A.F.; he is doing personnel work in the Pentagon.



Squadron Leader B. W. Taylor, D.F.C., R.A.F.

Basil Taylor was born and educated in Winchester, Hampshire, England. After undergoing flying training in the U.S.A. he served in bomber and air transport operations in North Africa, Malta, Italy, Burma, Ceylon, and Australia. His post-war duties included flying duties throughout the Berlin Airlift and staff appointments in the Personnel, Training and Intelligence branches. Immediately before joining Course 21 he served for three years on the Exercise Planning Staff at A.A.F.C.E. (AIRCENT), Fountainebleau. Basil and his American wife, Elizabeth, have two sons. The family returned to the United Kingdom on completion of the course and Basil has taken up new duties at the Air Ministry.



Lieutenant Commander H. R. Tilley, R.C.N.

Hal Tilley, 34, was born in New York. He attended the Grove School at Lakefield, Ontario, before joining the R.C.N. in August, 1941. During the following years he served in vessels ranging from a landing craft to a battleship and held several staff appointments. His career has included service on Atlantic and Russian convoys, the Normandy landings, and the Korean theatre. Prior to attending the Staff College he was Commanding Officer of the frigate H.M.C.S. Jonquiere on the West Coast. On graduation he was transferred to Halifax as Staff Officer Navigation Department to Flag Officer Atlantic Coast. Hal is married to the former Dorothy Coffin of Calgary. They have two boys and one girl.



Squadron Leader K. T. Wallace, D.F.C., C.D.

Ken Wallace, 34, was born and raised in Toronto and enlisted in the R.C.A.F. in 1942. His wartime experience included a tour of operations with the Pathfinder Force of Bomber Command. After the war he spent a year at the University of Toronto before rejoining the R.C.A.F. in 1946. During the Korean war he served with 426 Squadron and subsequently was appointed as check pilot for Transport Command. He came to the Staff College from a staff position in the Operational Requirements Department of Air Ministry. Ken is married to the former Virginia Wellings of Detroit, and they have three daughters. Squadron Leader Wallace is now in the department of the Chief of Requirements at Air Force Headquarters.

Lieutenant Commander M. E. Wasteneys, R.C.N.



Mike Wasteneys was born in Los Angeles in 1924, and after attending school in Toronto, he joined the R.C.A.F. in 1942. After a tour in Training Command, he transferred to the Fleet Air Arm of the Royal Navy, and subsequently to the Royal Canadian Navy. Throughout his naval career he has flown fighter aircraft, and in 1953 he commanded a Sea Fury squadron. He was staff officer (Air) to the naval member, Canadian Joint Staff (Washington) before coming to the Staff College. He is married to the former Mary Frances Sollenberger of Mexico City, and they have six children. Lieutenant Commander Wasteneys present appointment is Staff Officer (Plans) at Naval Headquarters in Ottawa.

Squadron Leader F. Watson, C.D.



Fred Watson was born in 1921 at New Toronto, Ontario. Fred enrolled in the R.C.A.F. in 1941 and served in Canada as a flying instructor before going overseas in 1944, where he flew Spitfires on tactical reconnaissance. Since then he has been employed in a variety of jobs connected with flying training; before coming to the College he served at Air Force Headquarters in the Directorate of Air Training, and before that he was Training and Operations Officer at the U.S.A.F. Pilot Instructors School. Fred and his wife, Edna, have two children, a son and a daughter. They are now living in London, Ontario, where Fred is Officer Commanding the Personnel Selection Unit.

Wing Commander C. F. Wattie, D.F.C., C.D.



Charlie Wattie was born in Camrose, Alberta, in 1918, but considers Barrie, Ontario, his home. A graduate of Toronto Normal School, he was a teacher before he enlisted in the R.C.A.F. in 1941. During the Second World War he completed two tours of operations as a navigator with Bomber Command. In 1946, he married Mary Wilson, a W.A.V.E. officer of Hartford, Connecticut, whom he had met when he was serving with the Directorate of Intelligence, Headquarters U.S.A.F. They have five children. Charlie came to the Staff College from Centralia where he was Officer Commanding the Pre-Flight School. He is now in the Directorate of Ground Training at Air Force Headquarters.

Squadron Leader G. A. White, C.D.



George White was born in Binscarth, Manitoba in 1920 and joined the R.C.A.F. in 1940. Following a short radio course he proceeded overseas, where he completed a tour of operations on shipping strikes with Coastal Command. After the war, he served at Training Command Headquarters as Postings Officer, at R.C.A.F. Station Centralia as Adjutant, and at Air Force Headquarters with the Directorate of Air Intelligence. Before coming to Staff College he was liaison officer with Air Ministry (Intelligence) in London. George and his wife, Delphin, with their two children have moved to Ottawa where he is working in the Directorate of Postings and Careers.

Major C. M. Whiticar, C.D.



Whit Whiticar, 37, was born and educated at Perth, Ontario. A member of the Royal Canadian Army Service Corps for almost 18 years, he has served in regimental, training and staff appointments in Canada, United Kingdom, Europe, and Korea. In 1952 he attended the Canadian Army Staff College, and was transferred from there to Headquarters, Prairie Command, Winnipeg, where he served as D.A.Q.M.G. until he was selected to attend the R.C.A.F. Staff College. In 1948 he married Yvonne Margaret Abernethy of Johannesburg, South Africa, and they have two sons and a daughter. Whit is now at the R.C.A.S.C. School, Camp Borden.



Squadron Leader G. J. Williams, D.F.C., C.D.
Willie Williams was born in Lindsay, Ontario, in 1917, and joined the R.C.A.F. in 1941. He was trained as a navigator and served in 6 Group, Bomber Command, for four years. Following the war, he completed radio officer training and thereafter carried out flying duties with 426 Squadron and at R.C.A.F. Station Goose Bay. Before reporting to the Staff College he served for five years in air training and personnel staff appointments. His wife, Margaret, is from Doune, Scotland, where she and their five children spent the past year. The family has since been reunited in Ottawa, where Willie has taken up duty in the Directorate of Organization and Establishments.



Squadron Leader W. F. Wiltshire, C.D.
Bill Wiltshire, 38, of Kitchener, Ont., attended the Kitchener-Waterloo Collegiate where he completed a course in accounting in 1936. He joined the R.C.A.F. in 1941 and was engaged in instructional duties until 1944 when he was posted overseas and flew Spitfires with the 2nd Tactical Air Force. After the war he was a civilian for one year, but in 1946 he returned to the R.C.A.F. and has since served in Training Command in various staff and flying positions. He was stationed at 2 Flying Training School before attending the Staff College, and his present appointment is in the Directorate of Airmen's Postings and Careers. Bill and Mary and their four children now reside in Ottawa.



Squadron Leader E. P. Wood, D.F.C., C.D.
Ted Wood was educated at The Grove School, Lakefield, and Queen's University. He joined the R.C.A.F. in October, 1939 and after training, and a tour as a flying instructor, he went overseas and completed two tours of operations on Spitfires. At the end of the war Ted resigned from the Air Force but rejoined nine months later. In 1953 he was transferred to 1 Air Division where he commanded a Sabre squadron for three years. He is now Staff Officer Intelligence at Air Defence Command Headquarters. Although Ted spent most of his growing-up years in Toronto, he has spent much time in Winnipeg, which is the home of his wife, Barbara. He has four children, three girls and a boy.



Squadron Leader J. H. Woods, D.F.C., C.D.
Jack Woods was born in Edinburgh, Scotland in 1920, but as a child moved to Newfoundland and was brought up in St. John's, graduating from Prince of Wales College. He joined the R.C.A.F. in 1941, and after a tour as a flying instructor in the Maritimes saw operational service with R.A.F. Bomber Command. After the war he spent six years in Edmonton in flying and staff positions and four years with 404 Maritime Squadron in Greenwood, N.S. He is married to the former Joan Parsons of St. John's and Montreal, and they have two sons. Jack is now serving at Central Experimental and Proving Establishment at Uplands, Ottawa.

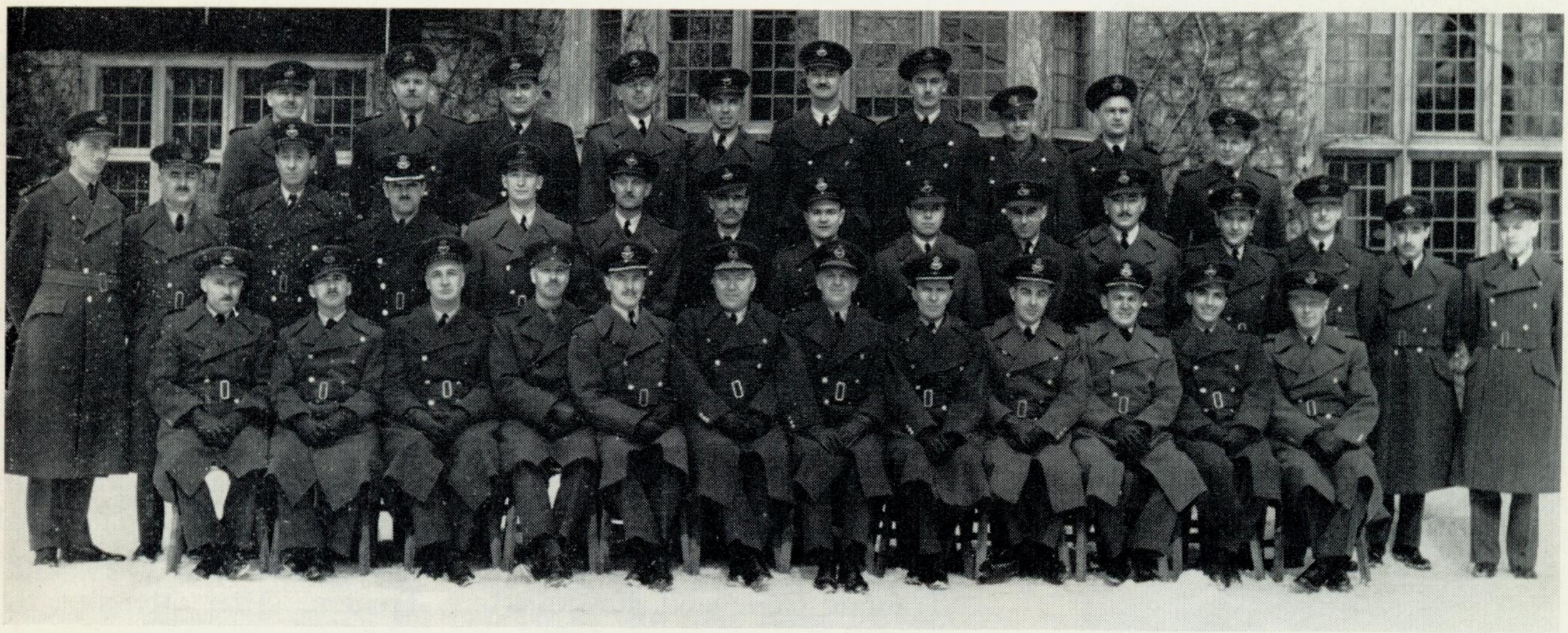


Lieutenant Commander J. G. Wright, D.F.C., C.D., R.C.N.
Garry Wright was born in Ottawa in 1922. He received his education in that city, and after graduating from Lisgar Collegiate Institute, enlisted in the R.C.A.F. in 1940. On receiving pilot's wings he served with an R.C.A.F. fighter squadron in Europe and an R.A.F. squadron in the Middle East. In 1945, after duty with Training Command, he transferred to the Royal Canadian Navy. Before attending Staff College Garry was Staff Officer Air Training for the Director of Naval Aviation in Naval Headquarters. He is married to the former Eileen Dunn of Cornwall, Ont., and has one son. Garry is now serving on the staff of the Flag Officer, Atlantic Coast.



FIRST WAR COURSE — 4 Oct. 43 - 11 Dec. 43

Front Row – Lt.-Col. J. G. Stewart, G/C G. H. Sellers, AFC, G/C H. B. Godwin, G/C R. M. McKay, A/C G. E. Wait, G/C R. F. Davenport, W/C E. W. Kenrick, S/L J. A. Grant, W/C V. B. Corbett, DFC. **Middle Row** – S/L E. B. Osler, W/C G. W. Jacobi, S/L E. Anderson, W/C J. L. Gray, W/C P. B. Pitcher, S/L V. M. Terry, S/L R. K. Fraser, W/C J. G. Stephenson, W/C R. W. Goodwin, W/C E. T. Webster, AFC. **Back Row** – S/L K. K. Hay-Roe, W/C C. H. Greenway, W/C A. T. Mason, W/C J. H. Roberts, AFC, S/L A. W. Roberts, W/C C. W. Crossland, S/L A. S. MacKinnon, W/C D. G. Price, S/L O. A. H. Sims.

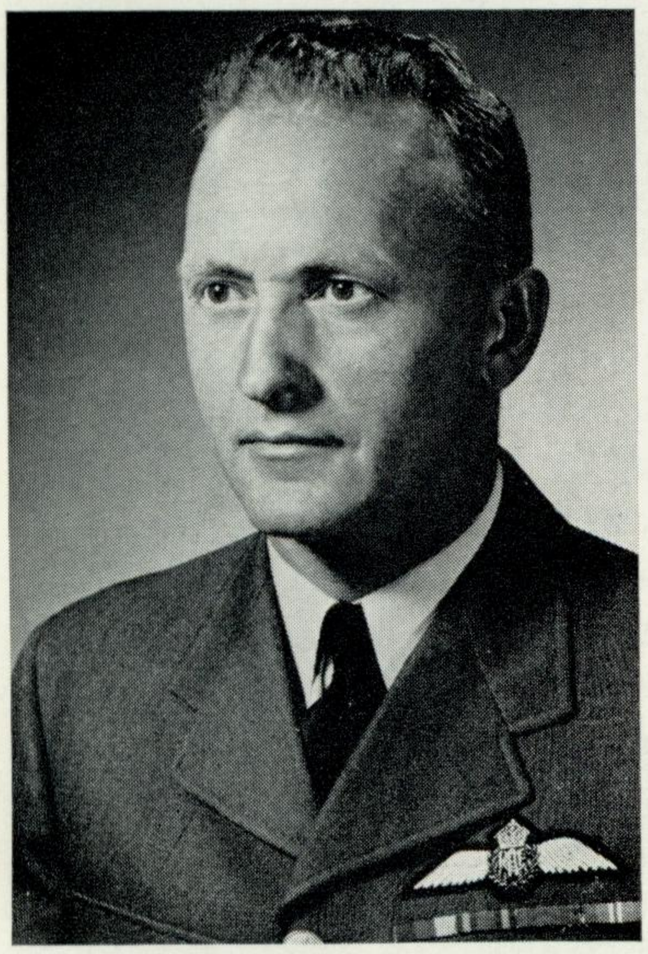


SECOND WAR COURSE — 3 Jan. 44 - 9 Mar. 44

Front Row – S/L G. J. Blundun, W/C M. G. Doyle, W/C R. K. Fraser, Lt.-Col. J. G. Stewart, G/C G. H. Sellers, A/V/M G. O. Johnson, CB, MC, A/C G. E. Wait, G/C R. M. McKay, G/C R. F. Davenport, G/C E. W. Kenrick, S/L T. H. Spear, S/L H. B. Hunter. **Middle Row** – S/L W. J. Wood, W/C E. A. D. Hutton, S/L V. M. Lynch-Staunton, G/C F. S. Carpenter, AFC, W/C R. J. Gray, S/L D. S. Laing, W/C R. C. Davis, S/L J. J. Jordan, W/C F. R. Sharpe, S/L P. M. Hale, S/L G. M. Martin, S/L N. David, S/L T. B. Robertson, S/L G. Vadboncoeur, S/L H. M. Lay. Back Row – W/C A. H. Miekle, W/C H. G. Malcomson, W/C R. M. Christie, DSO, W/C W. G. Welstead, S/L G. H. Carscadden, S/L A. E. Henderson, S/L V. L. Berg, Maj. G. H. L. Dempster, S/L W. B. Woods, DFC, W/C C. J. Campbell, MBE.

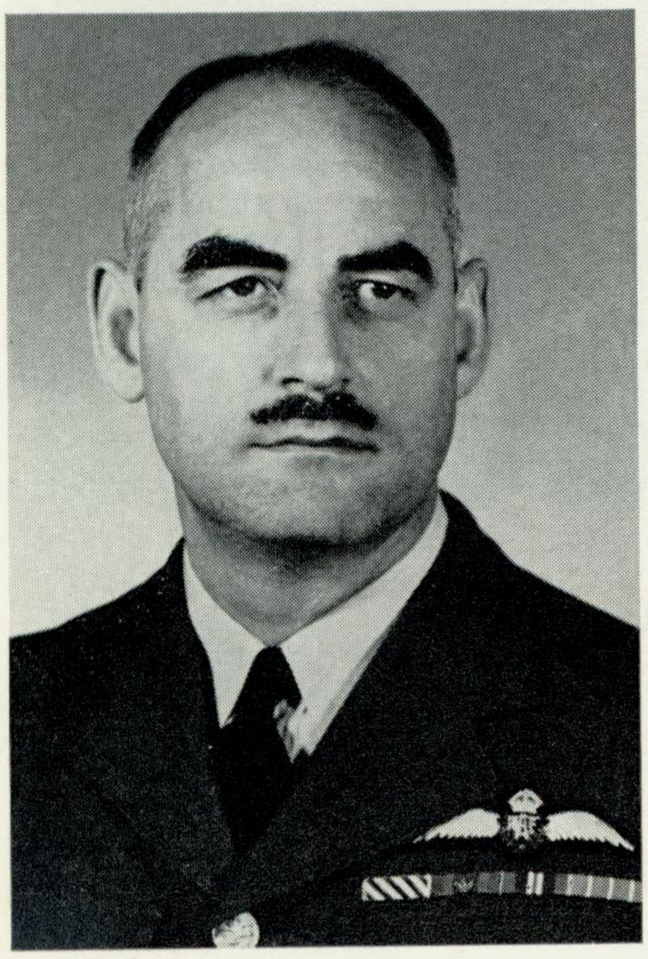
Biographies — Staff

"Reading maketh a full man; conference a ready man; and writing an exact man" — to which one might add that counseling maketh an understanding man. For as much as four years these members of the Directing Staff, who now leave the College, have been intensively reading, conferring, writing, and counseling. The R.C.A.F. is richer for their experience.



Wing Commander A. F. Brown

Art Brown, 43, is from Minnedosa, Manitoba. He first joined the Services in 1940 as a member of the Canadian Army, but transferred to the R.C.A.F. after a year with the 2nd Battalion, Canadian Scottish Regiment, at Victoria, B.C. He flew Liberators with the R.A.F. in the Far East during the war. On his return to Canada he served first with the Regular Force Auxiliary Support Unit at Vancouver and then in the Directorate of Postings and Careers at Ottawa, until he was selected to be a member of Course 17 at the Staff College. After finishing the course he moved to 4 Flying Training School, Penhold, Alta., but returned to the Staff College in November, 1955 as a member of the faculty. He has since been transferred to air staff duties at Canadian Joint Staff, London. Art married the former Florence MacDonald of Grand Forks, B.C., in 1942, and is the father of five children.

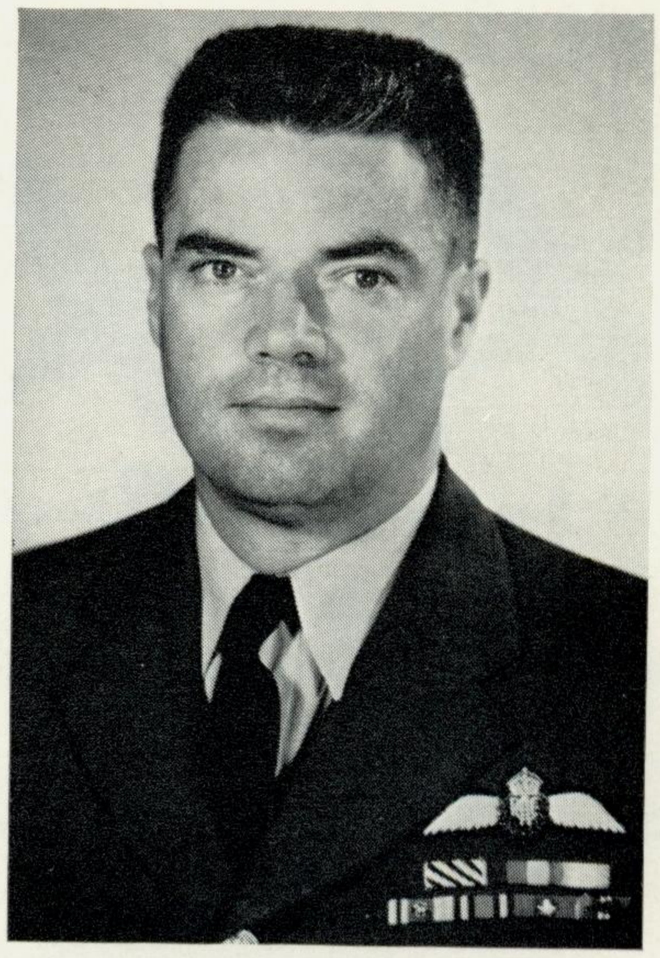


Wing Commander W. William Gilmour, A.F.C., C.D.

W. William Gilmour was born in Winnipeg in 1913. He attended public schools in Ottawa, Boston, and Montreal and after completing High School in Toronto, spent several years in business. He joined the R.C.A.F. shortly after the outbreak of war and after training as a pilot served as a flying instructor at Camp Borden. In 1945 he attended the Empire Central Flying School, England, and on return to Canada spent five years in the Personnel Branch at Training Command Headquarters, Trenton. After attending the Staff College course in 1950 he served as Commanding Officer at R.C.A.F. Station Calgary, and Officer Commanding 3 Flying Training School, Claresholm, Alberta. In 1952 he joined the Directing Staff at Armour Heights. He leaves the College this year for the Directorate of Airmen's Postings and Careers at Air Force Headquarters. Married to the former Sheila Campbell of Toronto, Wing Commander Gilmour has four children.

Wing Commander R. V. Manning, D.F.C., C.D.

Ralph Manning was born in Vancouver in 1916, graduated with a B.A. from the University of British Columbia in 1937, and joined the R.C.A.F. in 1940. He served three years overseas on torpedo-bomber squadrons in the United Kingdom, the Middle East, and India and Ceylon before returning to Canada in 1944 to take command of 8 Release Centre. In 1949 he became a member of Course 14 at the R.C.A.F. Staff College, at the conclusion of which he was transferred to 435 (T) Squadron as Senior Operations Officer. His tour on this squadron was interrupted by his posting to Air Defence Group, St. Hubert, as Staff Officer Plans and Requirements. Two years later he returned to the Staff College as a member of the Directing Staff where he remained for four years until his recent posting to Colorado Springs. He married the former Helen Kelman of Paris, Ontario, in 1941, and they have two children.



Wing Commander J. F. Mitchell, D.F.C., A.F.C., C.D.

James F. Mitchell was born in Toronto in 1916 and completed senior matriculation in that city. He joined the R.C.A.F. in the summer of 1940 and after a tour of duty as a flying instructor went to the United Kingdom in 1942. He completed two operational tours on heavy bombers, the second on a Pathfinder squadron, and then held various appointments in the United Kingdom before attending the first post-war R.A.F. Staff College Course at Bracknell. After serving at Air Force Headquarters in 1946/47 he spent two years as secretary to the Chief of the Air Staff and another two years as Officer Commanding North West Air Command "K" Flight. Before he joined the Directing Staff at Armour Heights in 1954, he was Assistant Canadian National Military Representative at S.H.A.P.E., Paris. He left the College to be Commanding Officer 408 Photographic Reconnaissance Squadron. Married in 1942 to May Leadbeater of Toronto, Wing Commander Mitchell has three children.



Wing Commander J. C. Wade, D.F.C.

J. Carleton Wade, born in Waasis, N.B., in 1915, attended the University of New Brunswick before joining the R.C.A.F. in 1940. Following duty in Canada as a flying instructor, he completed two operational tours in anti-submarine squadrons. At the end of the war, he returned to university to complete in the spring of 1947 a B.A. Honours course. After graduation, he served for one year on the staff of Air Member Air Plans at Air Force Headquarters before joining the staff of the Minister of National Defence where he served for two years. He then came to Staff College as a student on Course 15, and following this he served on Air Staff at Training Command Headquarters for one year and at 1 Air Division Headquarters for two years. He leaves the Directing Staff to be Officer Commanding, 2 Manning Depot, St. Johns, P.Q. In 1946 W/C Wade married Laurine Broderick of Windsor Mills, P.Q. They have one child.



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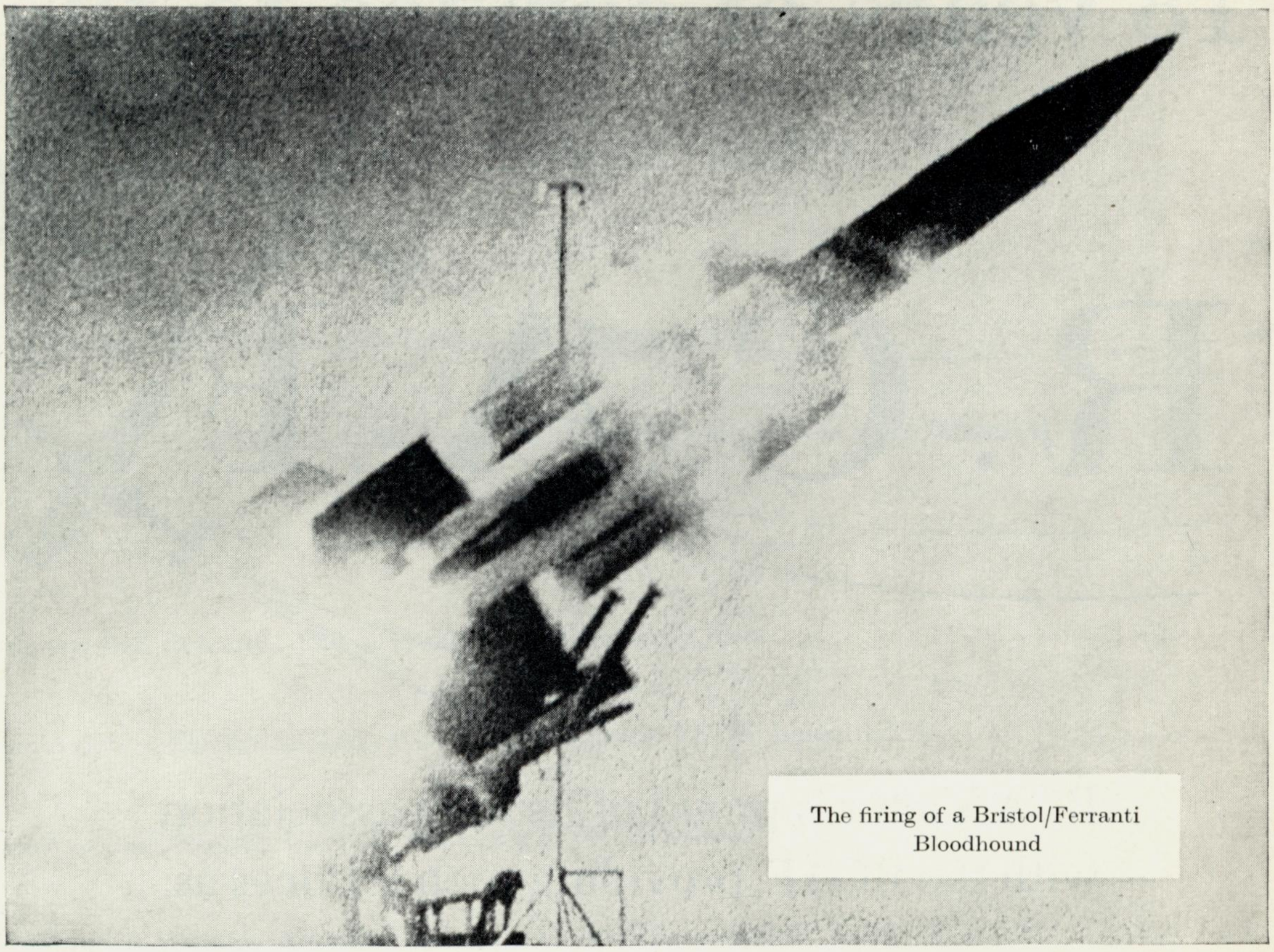
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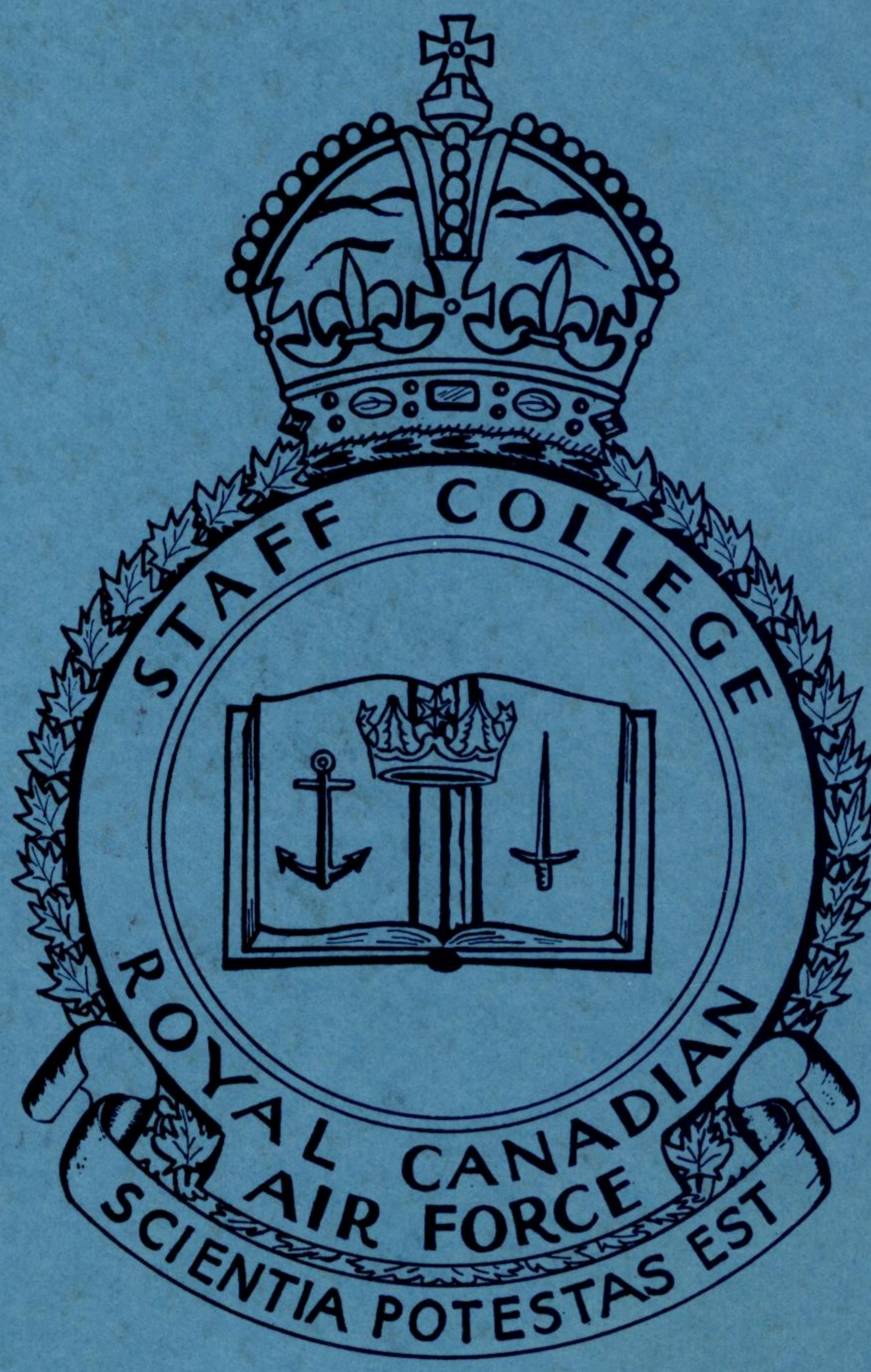
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