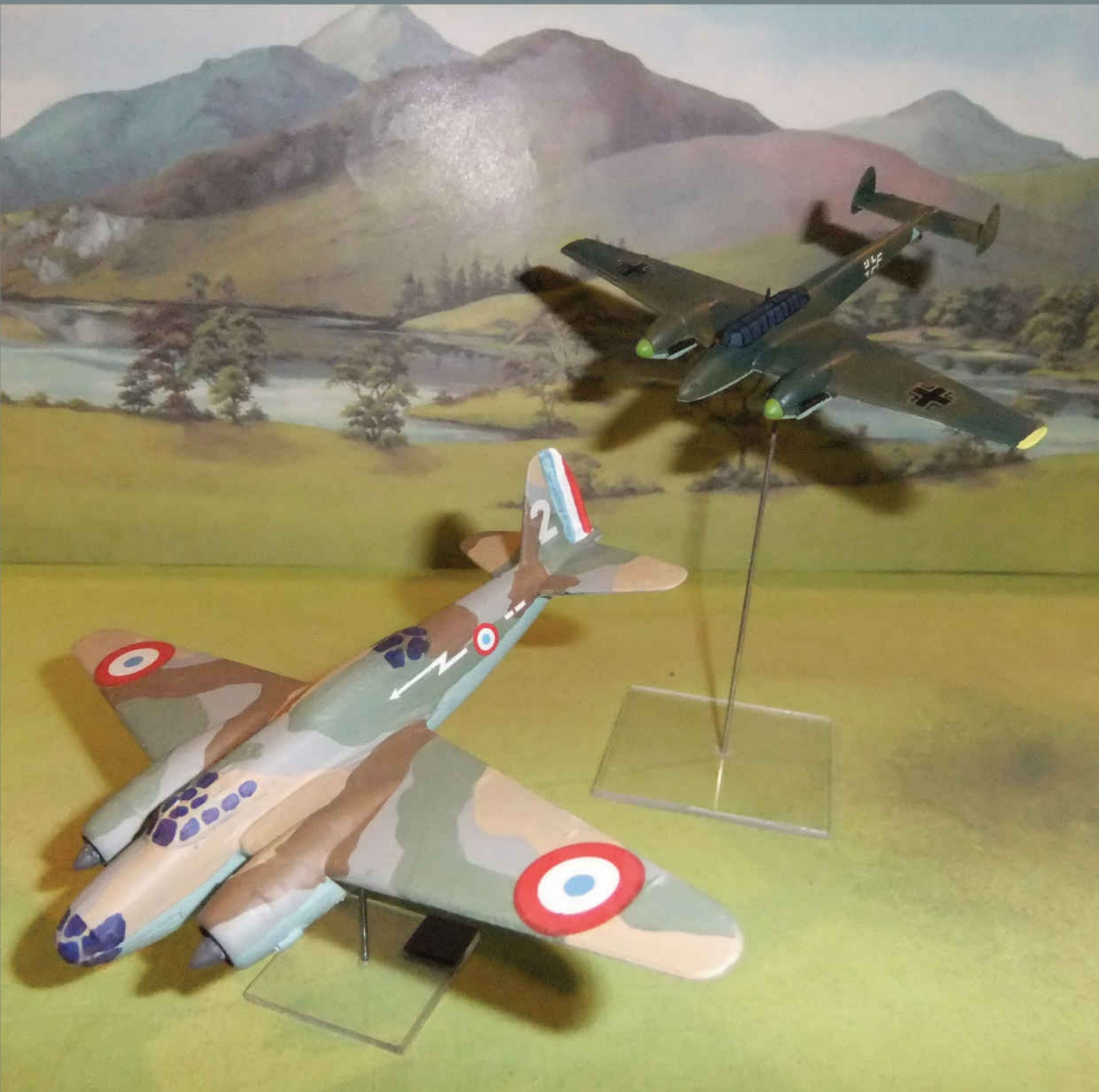# Donald Featherstone's Air War Games
Wargaming Aerial Warfare 1914-1975
Revised Edition

Edited by John Curry

Donald Featherstone's Air War Games

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Foreword to Revised Edition

Air Wargaming, like naval wargaming, is a niche within the wider hobby of wargaming. It can be broken down into three main periods; World War I, World War II and the jet age. However, there are also more exotic games, such as science fiction involving futuristic aircraft supporting battle-mechs or airships in an alternative Victorian England. The reason why air wargames have not gained a wider following within the hobby is not clear. Air wargames are cheap; all that is needed is a blue cloth and a handful of models. They can be made very visually appealing, such as colourful World War I aircraft flying high above a representation of the squalor of the trenches below. There are plenty of well-presented commercial rule books in print and a good selection of boardgames. The latter extend tactical air games and explore the use of airpower on a strategic level or in support of naval operations.

Donald Featherstone's view on the popularity of air wargames is that the genre has not yet seen the right set of rules and the right personalities. In air wargaming, there has been no equivalent of Fletcher Pratt[1] or Fred T. Jane[2] who popularised naval wargaming; there has been no Games Workshop that made fantasy and science fiction wargaming a part of youth culture and no Wargames Research Group that launched ancient wargaming as the most popular part of hobby. Perhaps the paradigm shifting set of rules which will make air wargaming a part of every wargaming club meeting are already in existence; perhaps they are not and the hobby is still awaiting them.

The original book on air wargaming by Donald Featherstone was popular and encouraged many wargamers to try their hand at writing their own air wargaming rules. Airfix models on cardboard tubes roamed across many a wargamer's kitchen floor in close fought air battles. Since the first edition, there have been many changes in air wargaming, so the opportunity has been taken to supplement the material of the original. This edition contains the following revisions to the original book:

Chapter 1: The Model Aircraft now has an introduction to some of the models and scales available to the modern wargamer.

Chapter 15: Commercial Air War Games. There have been a large number of boardgames dealing with war in the air. This chapter includes some of the classics.

Chapter 16: *Sturmstaffel: Defending the Reich Against The Terror Bombers*. This game is a good example of how straightforward rules can make a short, but entertaining air battle, particularly suitable for a wargaming show or to fill a gap at the end of a day's wargaming. The game is also suitable for a solo player to launch into the skies with a wing of fighters and try to stop the enemy air armada.

Chapter 17: *Rolling Thunder: Air Combat over South-East Asia* is a fine example of a cross between a boardgame and a miniatures game. The rules are straightforward, but are a simulation of the air war over Vietnam and the surrounding air space.

Chapter 18: *On a Wing and Prayer: Bomber Command in the Battle for the Ruhr July*

1943 is a solo game about the experience of Bomber Command during the critical battles in which the war fighting capacity of the German Reich was being crippled.

Chapter 19: The research section has been updated with a select bibliography to help initially guide the reader who wants to explore the subject further.

A number of wargamers following the History of Wargaming Project have asked about this particular book being reprinted. It is hoped that the delay in its publication will balanced by the new material to the original classic.

John Curry

Editor of the History of Wargaming Project

Preface

Having written a book on wargaming with model soldiers and another on fighting naval battles with model ships, it appears only logical to complete the trilogy by doing one on fighting wargames with model aircraft. With all its accompanying problems of space and how to make model aeroplanes stay up in the air, this book has probably been the hardest of the three to write. Practical experiments indicate that the methods described will work and give very satisfactory games.

There are almost certainly fewer people conducting air wargames than those on land or sea. This is rather anomalous, because the world is full of devotees of model aircraft who painstakingly make models that fly under radio control, with their own minute motors or by rubber strands. What do all these aeronautical fans do in the winter-time? Perhaps the long dark evenings might be satisfyingly filled by fighting indoor wargames with model aircraft.

I would like to acknowledge with the deepest gratitude all the invaluable help and information given me by those wargamers who are mentioned by name in this book. It is platitudinous but absolutely true to say that I could not have written it without their advice. All of them are far more experienced than I in this field, but they do not have the time to write a book about it!

It is with some temerity that I say how satisfying it is to write the first book ever written on this specific subject - I hope the reader finds it equally satisfying!

DONALD F. FEATHERSTONE

Introduction

There are a great many men and boys, aged from ten to one hundred, plus some of the more intelligent girls, who fight wargames with model soldiers.[3] They assemble them in armies, complete with cavalry and guns, and then throw them against each other in bloody combat on table-top terrains built up with hills, villages, woods, roads and rivers. The rules they use to govern these affrays are many and varied, and in a strange way reflect the personality of their compiler. So popular has this pastime become in recent years, after being given the benefit of pioneer patronage by writers Robert Louis Stevenson[4] and H. G. Wells, that the latter's early book on the subject[5] has now been joined by at least two more, plus regular magazines devoted to the subject.

A smaller number of enthusiasts, with the smell of the sea in their nostrils, devote much time and brain-power to fighting battles with model ships, or even fighting them without actually using the ships, in a most complex and diverse international postal naval wargame. Because of the vast distances involved in sea battles, combined with the undoubted intricacies arising from the offensive and defensive powers of the ships themselves, the rules for these games are far from easy to compile and the games are complex in their conception and execution. For those reasons, naval wargames are played by fewer people than play wargames with model soldiers.

Lagging along in the rear are those devotees of wargames with model aircraft; few in number and working in neglected insularity, they provide a paradox that could be claimed to be symbolic of this day and age. The reason for this latter statement lies in the fact that possibly aircraft enthusiasts can be said to have easier access to cheap and highly suitable models for their purposes than either the other two types of wargamers. But, with inexpensive plastic kits sold by even the smallest village shop and made up within an hour or so, the makers content themselves with doing the handiwork and then standing the results of their labours on a shelf to gather dust until broken or replaced, through sheer lack of space, by a new range of models. To obtain anything easily inevitably lessens its value in the eyes of its owner, but to go to the trouble of making single-mindedly a scale model, perfect in every detail, and then placing it to no useful purpose would appear to denote a certain lack of mental cohesion!

1/144 scale Ju-87 Stukas- German, Italian, Hungarian, Skovak and Rumanian. Models by F-toys, Revell and Eduard. Photo by Tim Gow.

The purpose of this book is to show by description, example and illustration the manner in which these wonderful and easily available model aircraft can be utilised in a fascinating and highly competitive fashion. Dormant within all of us lies a Walter Mitty[6]-like dream of piloting a colourful, fast-moving fighter plane or bringing back safely to base a sadly stricken bomber with one engine remaining. Thanks to Airfix, some of us have managed to don the garment of those chivalrous knights of World War 1 who fought nonchalantly in flimsy canvas-and-wire biplanes against Richthofen[7] and Immelmann[8]. By means of wargames with the exquisitely designed model aircraft that can be so easily made, each of us can peel off into the 'wide blue yonder' with an airy wave of our gloved hands as we dive to dog-fight over the shell-shattered trenches below. Or we can combine these new and obsessional games with model aircraft into our present land war games, bringing the realism of paratroop landing zones and D-Day gilder forays on to a table-top. The naval enthusiast cannot claim to fight any sort of modern comprehensive sea battle without using carrier-borne aircraft -Midway and the Coral Sea made that a certainty - so the naval wargamer needs aircraft and realistic rules to control them. Aviation is too big a factor in full-scale warfare to be left off the table-top because it is a little difficult to work-out methods of using the models.

Neither is it right to say, or even think, that adequate rules are impossible-the many friends and overseas correspondents who have assisted the author in writing this book prove by their very valuable contributions that this is not so. Admittedly, they differ in their views as any group of people in any other sphere will fail to coincide completely in their ideas. Self-described as an 'aeroplane nut', Bob Trimble, of California, believes that dog-fights are 'out' because he says there is just no way of duplicating a mêlée that spreads over hundreds of square miles at times in the few square feet available over a table-top. He may be right, but there are others writing in this book who think they can

have dog-fights and have been doing so with highly satisfying results!

Air wargames can be fought for their own sake alone; it does not seem outside the bounds of reason that some of those gifted and ardent enthusiasts who fly elastic or power-driven model aircraft outdoors in summer months might find allied interest in fighting air wargames during the darker nights of winter. For them the intricacies of aerial manoeuvre combines with the highest degree of technical knowledge of the various aircraft they employ - this is as it should be, because they are aircraft specialists exploring yet another facet of their interests.

On the other hand, it is eminently possible to tie air wargames in with figures on the wargames table, rather than to use either the figures or the aircraft as items to be used merely for themselves. These devotees are catered for in various parts of this book; in the author's opinion herein lies the greatest interest of all - what colour can be found in the suggested combats between dirigibles, as in H. G. Wells's book, *The War in the Air*[9], or in fighting the primitive aerial combats of World War I, as suggested by Bob Trimble, Alan Colquhoun and others? Of course, as an ardent land wargamer and author of a book on the subject (*War Games*, Stanley Paul & Co. Ltd, London, 1962[10]) the author of this volume is more than a little biased!

When recently writing a companion volume on naval wargames[11], the author intended to cope with the air side of the battles, along with suggestions for fighting with ships. But the book became more and more full of details for fighting with triremes, galleys, frigates, ships-of-the-line, destroyers, cruisers, battleships, submarines, combined operations, hunting raiders and so on, that there seemed to be no room for a set of rules covering aerial operations. Then it was realised that this was no mere single set of rules which was required -admittedly naval battles involving aircraft did not fit prominently into the picture until World War II, but warships did carry aircraft in World War I, and Fred T. Jane, the Izaak Walton[12] of naval affairs, wrote rules for the use of pre-1912 dirigibles in wargames!

Thus stimulated, the author began to cast around for ideas and inspirations, thoughts and theories on the fighting of battles involving model aircraft. There was a mouth-watering display of scale-model aircraft kits for as low as *two shillings*[13] each on all sides - there *had* to be a satisfactory way of using them! Recollections began to flood back of mentions in the letters of friends written over the years-references hastily scanned at the time - which dealt with methods of using aircraft in wargames; wargamers were canvassed, and trade, club and local circles contacted for valuable information.

The results can modestly be called amazing; from a situation where the author felt that by beating out his brains he might be able to write five thousand words on the subject of air wargames, sufficient material has been accumulated to expand into between thirty and forty thousand words! On re-reading those words they seem to 'jell', to co-ordinate into reasonably workable sets of rules which will give enjoyable and not-too-complicated

games; they appear to provide ideas and inspirations for new and different types of games, to give sources of supply and research references.

Some of the facts that came to light held aspects of interest and shed new light on hitherto unsuspected interests held by friends who had never previously breathed a word on the subject! One such almost shy admission came from veteran and 'elder statesman' wargamer, Archie Cass of London, famed for his collection of Roman soldiers and his much-copied set of rules for their use in wars of the period[14]. Archie relates how, in the halcyon period[15] between World Wars I and II, he and his brother invented an air wargame and played it with gusto for many years. It used side views of the aircraft and was played on a long board from either end of which the planes took off from their airfields, climbed up and took part in air flights - looping, diving, rolling, Immelmann turns, with high- and low-level bombing. The object of each game was to knock out the enemy airfield and each air force consisted of some five fighter squadrons (three planes in each); one scout fighter squadron (three extra-fast planes); three dive-bomber squadrons (three each again); and three heavy bomber squadrons. The bombers had to contend not only with enemy fighters but AA guns (three each side) and captive balloons with wires, two a side. The airfields were usually twelve squares long; a square could be knocked out by a bomb dropping on it, the idea being to make it impossible for the enemy to land or take off again. Most planes took up two squares, with heavy bombers taking three. The fighters and scouts fired straight ahead; the dive-bombers straight ahead and back *above* their tails; the heavy bombers had an extra gun, back and above their tails. All planes had pilots - two men in a dive-bomber and three in a heavy bomber - and each plane flew at a stated speed, and there were three normal rates of speed-climbing, level flight and diving, which differed according to the type of plane. Heavy bombers dropped their bombs from below the nose: dive-bombers from the nose-forwards. Archie assures me that it was an exciting game, and mentions, darkly, that it can always be re-created if he wants to!

1/300 scale Morane in Russian service over the eastern front in 1914. Photo by Tim Gow

Probably an allied factor to the difficulties of rules and methods of using

the model aircraft is that of lack of realism. Admittedly, a greater stretch of the imagination is required in air wargames than in either land or sea games; this is entirely due to the space factor, with accessory difficulties concerning methods of keeping model aircraft in the 'air'. This is a problem almost peculiar to air games; land wargames with model soldiers can be represented on the floor or on the table-top with relative degrees of realism; terrains used are sometimes of a standard comparable to those made up by model-railway fans. Naval wargames present greater difficulties because of the vast distances encompassed by fleets and ships on the oceans of the world. When we consider aerial wargames we not only have this space question to bear in mind, but there is also a considerable and potent speed factor involved.
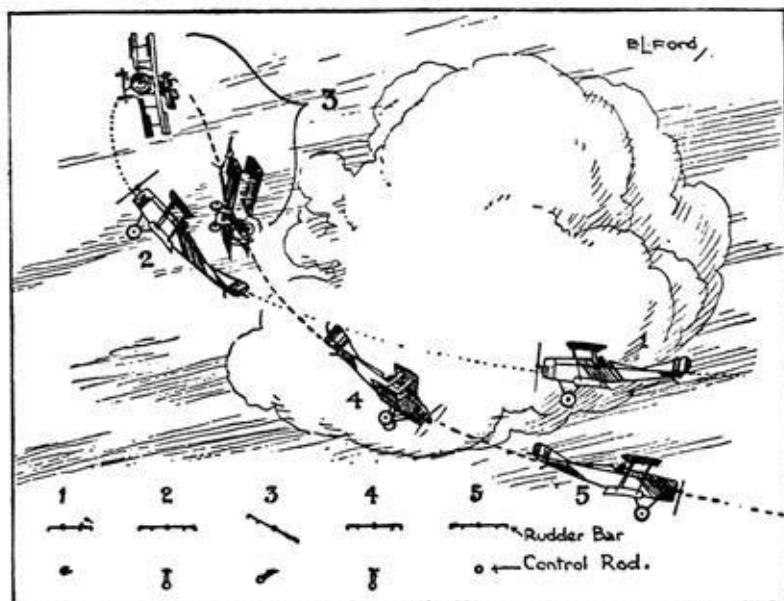
An Immelmann turn from a 1918 flight manual. The aim was to make a high speed pass, then pull climb, almost stalling, to turn around to be on the tail of the other aircraft. A somewhat dangerous manoeuvre by 1917/18 as it made the aircraft very vulnerable at the top of the turn.

With some little reluctance it must also be said that if you are a person who has been bitten by the bug of extreme realism in your wargaming, then air wargaming might not be for you, as it needs fairly wide stretches of the imagination at times. This can fairly be said to have its compensations in the superb and readily available models which can be most colourfully used in such games. Nevertheless, accuracy and realism must be considered and bring up some real puzzles, for example:

At scale 1:72 (the usual scale of model aircraft used in wargames) our air or ground scale is 1 inch = 60 yards. With larger-scale models of 1:48 (such as those made by Aurora[16]) the air or ground scale is 1 inch = 36 yards approx. Therefore a plane flying at 100 mph (obviously a World War I type!) will, on our wargames table, need to cover more than 670 yards in one hour! We have to work out the length of time that our moves represent - if we say each move equals one minute, then to be strictly accurate, our plane must move 33 feet 6 inches per move, which is out of the question, and immeasurably more so when we consider the speed of modern aircraft. In the same way, it is not really

good enough to blithely say, 'Machine guns and cannon on my aircraft fire 24 inches,' because, to the same scale, that means that they are hitting the enemy at 1,440 yards. One can tie in AA fire in the same way.

So some sort of allowances have to be made; they might be measures that will shock the realists, the sticklers for accuracy, but, after all it is only a game, isn't it? As a land wargamer of some considerable experience, the author has always felt that when realism interferes with enjoyment of the game, then realism must go out of the window!

With all these difficulties - and they are more theoretical than practical if you can look at it in that way - using model aircraft to fight wargames is a fascinating and relaxing pastime which ought to be much more popular; it is hoped that this book will aid in achieving that end.

1: The Model Aircraft

While discussing a revision of this chapter with expert air wargamer, Tim Gow, he commented on the original book.

"When I first read the original 1966 edition of *Air War Games* - the first of Don's books I had encountered - in the mid-1970's it was clear even to my ten year-old self that the list of available models was hilariously out of date. To rub salt in the wound, Don had included the 1960's prices. £0.10 for an Airfix Bf109 and £0.30 for an He111? Yes please!"

Donald Featherstone wrote in the original edition of this book:

"There is no field of wargaming - be it land, sea or air - that is so adequately covered from the point of available models as air wargaming. It is no exaggeration to say that the potential player could walk to the smallest village store and obtain, at once, sufficient inexpensive kits of plastic aircraft to be able to commence operations as soon as they are put together.

There are two principal scales of sizes -1:72 and 1:48 (the Marusan Company of Japan make their models in 1:50 scale). The lists of available models (complete at the time of writing but undoubtedly considerably increased since) are those of the main makers. Between them these makers cover pretty well every front-line machine used in World War II. Until recently there was a sad lack of Japanese and Russian aircraft, but this is now being remedied. However, there are still very few French and Dutch aircraft of that period available, whilst the unfortunate *Regia Aeronautica* of Italy seems to be completely ignored.

World War I is quite well represented and these kits provide the means of forming some of the quite fascinating combats, mentioned elsewhere in the book.

Here, then, is the list of models put out by the principal makers at the time of writing:

AIRFIX KITS 1:72 scale, Frog kits 1:72 scale, Revell Kits 1:72 scale and 1:48, Aurora Kits 1:48 scale and 1:72, Monogram Kits 1:48 scale, Forty Niners - Compact Scale Models, LS Range, Marusan range and APS."

Tim Gow has also listed aircraft manufacturers and scales:

"Back in 2012, rather than attempt the impossible task of listing all available models, I have compiled a list of the major manufacturers of wargame scale (up to 1/72) models.

Bf110 in four different scales- 1/72 scale (Airfix), 1/144 (Minicraft), 1/300 (Heroics & Ros), 1/1200 (Hallmark). Photo by Tim Gow and is reproduced with permission

Plastic Kit Manufacturers

Airfix. A large range of mostly 1/72 kits from WW1 to the present day. www.airfix.com

Revell. A large range of mostly 1/72 kits from WW1 to the present day. www.revell.com

Hasegawa. Various periods and scales. www.hasegawausa.com

Academy. WW2 and post-war kits in scales from 1/400 up. www.academy.co.kr/eng/new/new_main.asp

Trumpeter. Various periods in 1/700, 1/350 and 1/72. www.trumpeter-china.com/plus/list.php?tid=1

Zvezda. A range of 1/72 kits, and a new and expanding (hopefully!) range in 1/144. www.zvezda.org.ru/

Flames of War. Small but expanding range of 1/144 WW2 models. www.flamesof war.com

Wings of War. Completed plastic 1/144 WW1 and WW2 models. Nice but expensive. http://www.fantasyflightgames.com/edge_minisite.asp?eidm=24

Japanese 'Gashapon' trading models. These come largely pre-painted and require only some assembly. Available from HLJ. Mostly 1/144 models of WW2 and postwar aircraft.

Cafe Reo. http://www.cafereo.co.jp/

F-Toys. http://www.f-toys.net/

Metal Kits and Models.

Heroics & Ros. A very large range of 1/300 model from WW1 to the present. www.heroicsandros.co.uk/

GHQ. Pricey but very high quality 1/285 WW2 and postwar models. Helicopters now

have etched brass rotor blades. www.ghqmodels.com/

C in C. 1/285 WW2 and postwar ranges. www.pfc-cinc.com

Raiden. Miniatures. 1/285 WW2 to modern range. www.raidenminiatures.co.uk

Irregular Miniatures. 1/300 and 1/600 ranges. Lovely people and super-fast delivery. www.irregularminiatures.co.uk/

CAP Aero. 1/1,200 metal models. www.navigatorminiatures.com

Skytrex. Metal models WW1 in 1/144 and WW1 to modern in 1/300. www.skytrex.com/

Tumbling Dice. A impressive range covering WW2 and later in 1/600. www.tumblingdiceuk.com

Reviresco. WW1 and WW2 kits in 1/144 covering some unusual subjects. www.tin-soldier.com/

True North. 1/144 WW2 range. www.oldglory25s.com

Some useful retailers – all do mail/internet orders

Hannants. Large UK-based stockist of kits and accessories. www.hannants.co.uk/

eModels. Kit retailer with excellent internet ordering service. www.emodels.co.uk/

HLJ (Hobby Link Japan). Japan based (but English-speaking!) retailer of kits and Gashapon models. Easy to deal with. www.hlj.com/

Wargames Emporium. Stockists of GHQ, C in C, Flames of War and many other wargame and kit brands. www.wargamesemporium.co.uk/

Of course, the monthly aero modelling magazines are an excellent way to find out what new plastic kits are available for 1/48, 1/72 and 1/144 scale aircraft.

As a cheap alternative to models, there is also the possibility of printing aircraft top-down silhouettes on thin card. These can look surprisingly effective and are very useful for a wargamer to try out a few air wargames. See www.juniorgeneral.org/index.html for many top-down silhouettes.

A 1/444 Bf-109E (Revell) pursues an I1-4 (converted from a Japanese bomber kit) Photo

by Tim Gow.

Donald Featherstone finished off the original chapter by saying:

"Bob Trimble, who features prominently in these pages, writes helpfully on the subject of making planes to fit in with his World War I campaigns:

Choice of Scale: Of all the possible scales, 1:72 is the most practical for use with units on the table-top, since aircraft built to this scale can be used with very little trouble with 20, 25 and 30mm figures, being close enough to all three so that comparison between the planes and figures or gear on the ground would not be too ridiculous. 1:72 models also take up less space, are easier to build and are cheaper than any other size; kept simple, they can be turned out by the dozen if a real air force is desired."

Fortunately for the modern wargamer, since those pioneering days, there has been a huge range of aircraft produced for modelling and wargaming purposes.

2: Methods of Using Model Aircraft in War Games

Roughly speaking, the model aircraft used in aerial wargames must either be suspended, held up on stands or used on a flat, single-dimensional board. The snags inherent in such enforced methods have already been discussed - their solution lies in the mystic realms of genius-cum-invention provided by future war-gamers! Equally, it has seemed as though air games must be either played on (or over) a table-top or the floor; it is when we consider the latter prospect that a new vista opens up before our eyes. Because it involves space it is an obvious line of reasoning; after all, the principal feature of aerial warfare, the common factor uniting all periods, has always been that the operations took place in the most expansive, wide-open spaces known to mankind - the sky.

To the air wargamer, 'sky' is a relative term - to him it begins an inch from the table-top or floor over which his models are intended to operate. This being the case, it is not difficult to conclude that the wargamer can conveniently assume that every room in his house is full of 'sky' which can be used for his game.

Take a look around you - cosily nestling about every single item adorning the room in which you are sitting is *space*, vast 'miniature' areas of operational terrain upon which can fly your fighters, bombers, reconnaissance aircraft and helicopters. Conscious that few rooms are ever completely bare of furniture, except on the actual day of moving in, we can assume that our room has the usual assortment of chairs, tables, television sets, radios, mantelshelves, coffee-tables, lamp standards, pictures, picture-rails, door- and window-frames. In other words, the room presents the usual and expected picture of a comfortably cluttered area - *but* it also presents the air wargamer with a ready-made terrain!

The outstanding feature of most rooms full of furniture is that they present an astonishing variety of surfaces and levels, all of different heights - except in the well-organised kitchen with its one-level working surfaces (and we'll find a use for that before we finish!). These different levels are tailor-made for our purposes - each and every one of them provides a resting place for one form of aircraft or another, so that each model is, realistically, at a different height in the 'sky'! The lurking fighter, coyly nestling on the lampshade, situated high near the ceiling, can (within the limits of its pre-ordained move-distance) come screaming down upon the unsuspecting bomber as it waddles along from the top of the TV set to the mantelshelf via the back of the settee. Intent on hitting the same target (a small town craftily sitting under the coffee-table) the low-flying Mosquito comes hedge-hopping across the room, resting successively between each move upon the seat of an armchair, a low stool, and the bottom rungs of an upright chair, until it makes its final run-in along the bare surface of the coffee-table. But all is not plain sailing - upon the same apparently bare surface suddenly appear evil black bursts of flak[17] (cut-out cardboard shapes) and - in strict accordance with the prevailing rules - the gallant little aircraft is brought down in flames (prepared and coloured cotton wool) to the off-white Indian carpet 'earth'.

There are innumerable variations on this 'room-sky' game - bearing in mind that a room, say, 15 feet square by 10 feet high will give a vast cubic area in which to operate.

The light weight of the plastic models that are used is also a big factor in the game, because it enables relatively delicate objects such as lampshades to bear their respective aircraft. Most wargamers will use rules that are similar in basic character; our individual rooms will give us specific problems, and local situations that will govern our games, to say nothing of unscheduled onslaughts from children, pets and indignant wives! A set of cards may be made up to give wind direction and prevailing weather conditions, including fog and mist; a card can be drawn every third move, for example, so that a new situation is thrust upon the combatants. Well, there is one way of expanding your game beyond the realms of a single table-top; all that you need is a set of model aircraft and a library ladder or stool upon which to stand when placing the aircraft at their correct heights.

To the realist, the man who deplores the introduction of such 'comic opera' features into what can be a serious and almost scientific pastime, what has been written up to now in this chapter is probably pure agony. Let him take heart - there is much to come that bears the hallmark of attempted realism, such as the plan devised by P. J. S. Lippett of London, who used a huge sheet of glass raised about 2 or 3 feet above his normal war-games table, all air movements being made upon this transparent surface. It was found that the biggest problem arose from the fact the entire system relied on a grid system, so that the user needed to be a mathematical expert to synchronise the land and air forces, especially so far as flak and strafing were concerned.

Of a much more complicated nature is the Services training method described to the author by a World War II Fleet Air Arm pilot, who recalled using it during his tactical training days. In a large room a section of the 'floor' about 15 feet square was made of glass, with a 'pit' hollowed out underneath the glass, which was marked off in a grid as required. From the bottom of the 'pit' light beams were shone up on to the underside of the glass, each beam being in the shape of the vessel it was intended to portray. With one syndicate or trainee operating the aircraft-shaped light, whilst another such group handled the surface-vessel beam, such operations as plotting interceptions of submarines and warships were carried out. Each side was out of vision of the 'board', on which was laid, before the umpires, a moving scene of the interception and evasive actions taken by both opponents.

In this case, of course, we are back with our third choice of method - that of the single-dimensional arena on which horizontal movement is possible but on which actual height variations are precluded. J. H. Risdon of London has long been working on the aerial campaign to be fought rather on the lines of a game of chess, markers or counters being used to denote formations of single aircraft. The board needs to be the largest possible scale map, suitably squared, and if one wishes the highest degree of Battle of Britain realism these counters should be quietly moved by attractive and uniformed young ladies to the accompaniment of bad language over the intercom! The bombers and fighters need to have different moves and ranges, counters being used to represent false raids to draw off enemy fighters and keep the defenders guessing. Because of radar and the extensive coverage of enemy territory, concealment of forces would not be necessary.

Through experience it has been found that the essential ingredient to bring success at this game is bluff - in the shape of radio countermeasures or the false directions given to defending fighters by the attacking force. When RCM is used, then unmarked counters are necessary - they will merely inform the defenders that a formation is in a certain locality. The question of false instructions to defenders presents difficulties, and it might be necessary to fall back upon the 'chance card' system (sets of prepared cards giving a variety of alternative actions and counteractions). The use of such cards reduces the skill element, however, and detracts from the semi-professional interest with which such games are fought.

Mr Risdon does not feel that modern air wargames are really possible, as they bear highly unrealistic factors owing to the range of the aircraft and the weapons being quite out of proportion on the table-top. There is also the consideration that owing to the rapid development of radar and RCM, tactics vary almost from day to day.

Next let us consider what seems to the author to be the most promising of the methods at our disposal - that of suspending models from above. \These methods are fairly self-explanatory, but can be varied and elaborated to taste, the basic factor, being that, whatever the method of suspension, the model aircraft hang over the table and can be moved in accordance with the rules of your game

American enthusiast Bob Trimble of California has some ideas on the subject; he has made a frame of ¼ inch wood dowelling which is the same size as his table lying beneath. At 6 inch intervals he has strung heavy nylon monofilament lines across both the long and the narrow dimensions of the frame, forming a 6 inch mesh. The frame itself is hung from the ceiling on hooks, using heavy nylon cord over a pulley, with a retaining cleat in the wall to take the end of the cord. Thus, it will bear a marked resemblance to the wooden frames that used to hang in the kitchen, being lowered so that the laundry could be hung upon its slats and then pulled up to the ceiling, where, out of the way, the clean linen could be aired in the hot air which rose upwards. The height of the operational frame over the wargames table will have to adjusted by experiment, thus avoiding skull fractures or slipped discs.

The model aircraft will need to have small wire hooks fixed to their structure, making sure that the right point of balance is obtained, otherwise they will hang unrealistically askew. They are then hung on to the nylon mesh by their hooks and moved from square to square in accordance with their regulation move-distance. This movement can either be done by hand - which might become difficult and necessitate the use of a ladder or a chair - or else by a pole with a prong on the end. In the latter event a certain degree of practice will be required before proficiency is attained and models can be moved accurately and without damage! Bob Trimble has found that it is necessary to have the nylon strung as tightly as possible, otherwise it sags in carrying its load, light as it might be. He also discovered that there are advantages in using 'formation triangles' made of plexiglass[18], each triangle being made so that it can take flights of three planes, stepped realistically as in real life. This method is described in more detail under the chapter dealing with World War I air games. Ground-attack types will have to be solo, naturally - Bob writes that Hawk's Corsair is perfect for this sort of mission, being cheap and readily available in kit form; there are also many other models available for this type of operation.

As becomes an 'aeronautical nut' (as Bob Trimble describes himself), he has delved far and deeply into the intricacies of aerial wargames. Among his other investigations, he has considered the idea of night fighters and fought games using a small blue light-bulb; next he came up with a "horribly complicated radar screen, which might work or might electrocute the people trying to use it, besides being highly involved with its hundreds of feet of wiring and an intercom system using surplus headphones and mikes." For strategic missions Bob hangs the overhead frame and net over a large map on the floor; this map covers the routes into the target and surrounding country, and the players just walk across it as they move their respective forces.

Pioneer of land wargames of the 1941 period, fighting with 20mm scale-model soldiers on a most realistic sand-table terrain, Lionel Tarr of Bristol has contributed a very great deal to the art of air wargaming. He says that when he first began his Russo-German campaigns of 1941 he was able to use kits by Airfix for the *Luftwaffe* but had to make his own heavy bombers and transport aircraft and all his Russian planes, as there were none available at that time. He carried out numerous experiments into methods of handling the models, and for a long period they 'flew' into action upon stands which he found most difficult to place in position without knocking over men and material on the table-top battlefield. Then he had the idea of a net, held in position over the table; he locked himself up with the table, some strong canes for uprights and three reels of tailor's button-thread. He says, "With grim determination I made a net of 6-inch mesh (later reduced to 3 inches) *upon* which my aircraft were to 'fly'. The results were excellent and worth all the great trouble I had taken; there were no more stands sprouting up from the table-top terrain, and I was left with a clear field for ground operations with visibility unhindered." On this net Lionel Tarr would move his aircraft their prescribed distances, dodging in and out of the 'clouds' made from coloured card and also laid upon the net! Later, came further inspiration, and he substituted for the net a large sheet of thin, transparent plastic (from the Marley shop) and held in suspended position, tautly over the table, by the four corner uprights and cross-pieces of thin wire or cord. From that, Lionel progressed to a much

stiffer and firmer material, a type of polyglaze, which seemed to work even better than previous materials.

However, there still remained the gymnastic business of clambering up and down to move aircraft as they progressed across the battlefield. After much brain-searching Lionel finally hit upon a relatively simple method of making his aircraft 'fly' over the table. In fact, two alternative methods presented themselves, each of which has considerable merit. The first consists of attaching a small strip of metal to the top of the model aircraft, then a magnet is placed on the *top* of the plastic sheet - this holds the aircraft above the table and realistically underneath the plastic sheet; to move the aircraft the magnet is moved in the desired direction and the model faithfully follows suit. The second method does away with the climbing up and down - here the metal strip is attached to the underside of the aircraft and the magnet to the tip of a long pole. The aircraft lies on top of the plastic sheet, and to move it the pole with its magnet-tip is moved underneath the plastic and the plane follows accordingly. Simple, isn't it?

If you are lucky enough to possess a permanent wargames room there is a simpler method of suspending aircraft over the table than by having heavy and cumbersome wood frames with mesh-work stretched across them. At a convenient height above floor level - say about 7 feet - plug two lengths of wooden slatting along the wall from one end to the other so that they are opposite each other and the width of the room apart. At 6- or 12-inch intervals screw small hooks (such as the type used to hang curtain wires across a window) into the wood slatting, making sure that they are exactly opposite each other. From each hook stretch a length of nylon line across to its partner on the opposite side of the room until you have a series of cross-lines stretching right over your table and sufficiently high to be out of the way.

The model aircraft can now be hung and moved up and down or across the table; for a variation in position, or a diagonal movement, lengths of wire can be provided so that they will hang 'between' the cross-lines and the aircraft hung from them. Height can be altered by having a selection of wires of varying lengths pre-cut and bent into hooks at the top ends; then the required length (with its aircraft hanging on its lower end) can be placed in position where required. By using a graduation of various lengths it is possible to achieve a 'run-in' for a glider or aircraft or to dive-bomb almost directly downwards and then sharply climb after the missile has been released. A different method of doing this is to replace the 'height wires' with lengths of nylon cord, each with a sliding 'block' so that the length of the cord can be altered as required. These cords and slides can be obtained from shops selling model-ship accessories

It is possible to use single aircraft in a wargame involving model soldiers (for dive-bombing or 'shooting up' a convoy, for example) by having a single nylon line stretching downwards from a hook in the wall. In this line at regular intervals are loops on which the aircraft is hung at the various halting points between its move-distances. The line will stretch downwards, in a slack arc or a tight, straight manner as required; it will be fixed to the table-top at its bottom-most point and then rise upwards (again slackly or in a tight line, as desired) and be fixed on the far wall opposite.

The dive-bomber will require a line that is nearer the vertical than will the glider or model coming in on a low-level attack; for the last two the angle of the line will be much flatter. The aircraft will move along the line for their respective move-distance, being hung at the nearest loop between moves, the loops being equidistant and measurable will also provide a lead for AA effects on the descending aircraft.

Another method of suspending aircraft over the 'earth', which does not require the admittedly complicated devices involved in hanging frames from ceilings, lies in having the suspension apparatus projecting from the wall. This is done by plugging a sheet of peg-board flat to the wall in the usual manner, then using the commercially acquired fixing apparatus with lengths of stiff wire soldered to its projecting end. By this means the wires can be most securely anchored to the board so that they will project out from it for their entire length, and the aircraft can be suspended from the wire's end or at any point on its length. The wires can be of varying heights and distances apart, and can be diminished in number by attaching cross-pieces to each wire so that more than one aircraft can be held. The end effect should be much like an abstract mobile!

A 1/300 scale He-111 passes over Soviet border defences in 1941. Photo by Tim Gow

Finally we come to the stand or tripod method of arranging model aircraft in the air - this is not a particularly satisfactory manner of working, as it is unsightly and most unrealistic in appearance. Probably the best method of handling this type of aircraft-manoeuvring is that suggested by Staff Sergeant Roger Moores of HQ, BAOR. He mounts a model on a ball-joint which is, in turn, attached to a length of telescopic rod - such as the radio aerial used on a car. If possible the telescopic rod should have at least six sections, each of which represents 2,000 feet. The rod is stuck in a weighted base strong enough to remain upright when the full length of the rod has been extended.

Lionel Tarr has already been mentioned in connection with his method of suspending and moving aircraft over a table; in his pioneer days he used the stand-and-rod method, with each rod being a different height and scaled accordingly. Bob Trimble of California suggests a 36-inch long piece of stiff piano wire mounted on a base that has three short

legs, this tripod being not so space-consuming on a battlefield as the round or rectangular wooden base. To move the aircraft in all cases you just move the base and then dodge swinging wing-tips! The wire is marked off in 12-inch sections, each being equivalent to 1,000 metres of altitude; the 10,000 metres or so ceiling putting the aircraft out of reach of anything but special AA guns.

An interesting idea is to have the entire table-top covered in peg-board; the small holes will not make the slightest difference to the laying down of hills, woods, villages or the model soldiers, but these same holes will provide frequent and regularly spaced billets into which to slot the bottom ends of the supporting wires.

Alan Colquhoun of Lagos, who has provided ideas for two air wargames in this book, uses a 'cakestand' method of supporting his aircraft. Vaguely similar to a bare Christmas tree, the supporting apparatus has an upright trunk, with numerous transparent plastic shelves (wires would also do) projecting on either side - the shelves being large at the bottom and getting smaller as they ascend. The aircraft are poised or laid on the shelves and moved according to their specific rules - the shelves and their distances apart being scaled as required. In this way one has height as well as being able to disperse one's aircraft over the table without having to use more than one stand (and horribly unwieldy base!) That doyen of American naval wargaming, Fletcher Pratt, admitted that having airplanes in an extensive sea game played on a large floor presented an intricate problem. He found that their handling involved almost as many rules as for the ships themselves. Having such vast expanses of 'ocean' – these 1940 period games were played in armouries, gymnasiums and ballrooms by large numbers of players simultaneously - the difficulties involved in having unwieldy bases all over the place were minimised. The same large playing areas precluded using overhead suspension for the aircraft, however.

The Fletcher Pratt[19] apparatus consisted of a heavy iron ring called a flange, which can be purchased in any ironmonger's. Into it is screwed a length of wooden dowelling 36 inches long - 3/4-inch dowel and the appropriate flange are recommended to ensure the necessary stability. The dowel was marked off into numbered equidistant 'levels' - Pratt used 14mm to the level, which allowed sixty-five levels per rod. Around the dowel, and sliding up and down on it, a spring clip with a screw end (a type used to hold brooms in a cupboard) is placed. The up-and-down movement of the airplane is obtained by sliding the clip on the rod; its horizontal movement by moving the rod (in its flange) across the floor.

On the screw end of the clip the aircraft was placed; it can be a model aircraft or a picture or silhouette of the required type stuck on to thin cardboard. If the latter method is used then it is possible to get formations or squadrons of aircraft on to one clip by triangular-, diamond- or 'Y'-shaped pieces of thicker card or Perspex, onto which the small flat pictured aircraft can be clipped or taped into their required positions.

A rubber band can be put around the dowel rod to indicate its petrol supply; start the band at the number of moves the plane is to be allowed before refuelling, and move it down one numbered level at each move. When it reached the bottom of the rod the plane must come down for lack of fuel. There are two methods, both extremely theoretical and

both untried by the author, which give a little of both worlds in that they provide both a hanging and a supporting role. The first consists of lengths of strong, firm wire which is slotted into a piece of 1 inch x 1 inch wood fixed along the edge of the table; it is so arranged that the wire, bent into a graceful parabola, stretches out over the table-top rather like a fishing-rod over a stream. From the very end of the rod the aircraft can be brought closer or sent further away by reeling in the line which runs through a loop bent in the far end of the wire, thus enabling the model to run the length of the wire, suspended slightly beneath it. From that fishing-rod inspiration must inevitably come a piece of near-lunacy that could bring in its wake disaster, both to the model aircraft and to surrounding furnishings, but, if handled with skill and practice, could also provide a most realistic effect. The aircraft is attached to the bottom of a line, which, in turn is fitted to a fishing-rod or something approximating to one, in the manner of a fisherman casting his line or fly-fishing, the latter requiring much practice! The end result, if successful, would be a swooping, diving action of the aircraft, although the caster would probably be in a highly tense condition after trying to formulate rules to fit such variable movements.

There are probably other means of using model aircraft in wargames which have not occurred to the author or to his various correspondents - they might well be so simple as to have been overlooked or so intricate as to be beyond their simple reasoning! If this chapter is considered as being purely for inspirational or guidance purposes then its stimulation might well bring a revolution in wargaming with model aircraft.

3: Pre-1914: the Balloons and the Early Aircraft

There are sufficient historical aspects of war-gaming with model aircraft to thrill the imaginative reader - even if it might be difficult and complex to formulate rules to fit such activities. Even so, such rules surely could not be more intricate than those required to cope with the aircraft of the post-World War II period!

When this period is considered in detail it is obvious that one has to begin not with aeroplanes but with balloons! These were used as far back as the American Civil War [20] for observation purposes, and in the same role during the Boer War and the Spanish-American War in Cuba. This means that they can be used in conjunction with land wargames; for example, an army having a balloon aloft will be entitled to know enemy strengths and dispositions whilst keeping their own concealed. The wargamer can make whatever use he likes of the knowledge that a French statesman escaped by balloon from Paris [21] during the Prussian siege of 1870! And now for the $64,000 question - from where can one obtain scale models of balloons? And the answer is - in a phrase - who knows? It seems as though the ingenious wargamer must make his own, and this should not be beyond his capabilities. Obviously, the balloon will have to be suspended from above over the wargames table, so it does not necessarily have to be capable of holding air. On the other hand, it could be made of a child's balloon, partly blown up, or a plastic bag, both of them with sellotape or a fabricated cotton-mesh arrangement attaching the basket suspended below. It might be possible to cut strips of this plastic sheet into the correct shapes to make up into a semi-round balloon when they are glued or heat-welded together. Bob Trimble of USA has ideas on this. He writes:

Construction Plastic sheet heat-formed over a balsa model carved styro-foam, papier mache, or any light-weight material; a piano-wire hook set at the balance point, figured with basket and observers attached; moored to a ground platform or winch truck.

Use Hung behind the trenches, would extend the area under observation back a certain number of infantry moves, or reckoned from the nylon net mentioned last year (dropped straight down from the lines, gridding off the whole table-top). A digression: back of the trenches, all units would be represented by 3x5 file cards, their strengths written on the faces and the backs painted the distinctive national uniform colour; as the cards are moved into an area under observation, they are turned face up and the figures placed on the table; blank-faced cards could be used to cover actual movements, like Patton's phoney army in England before the invasion.
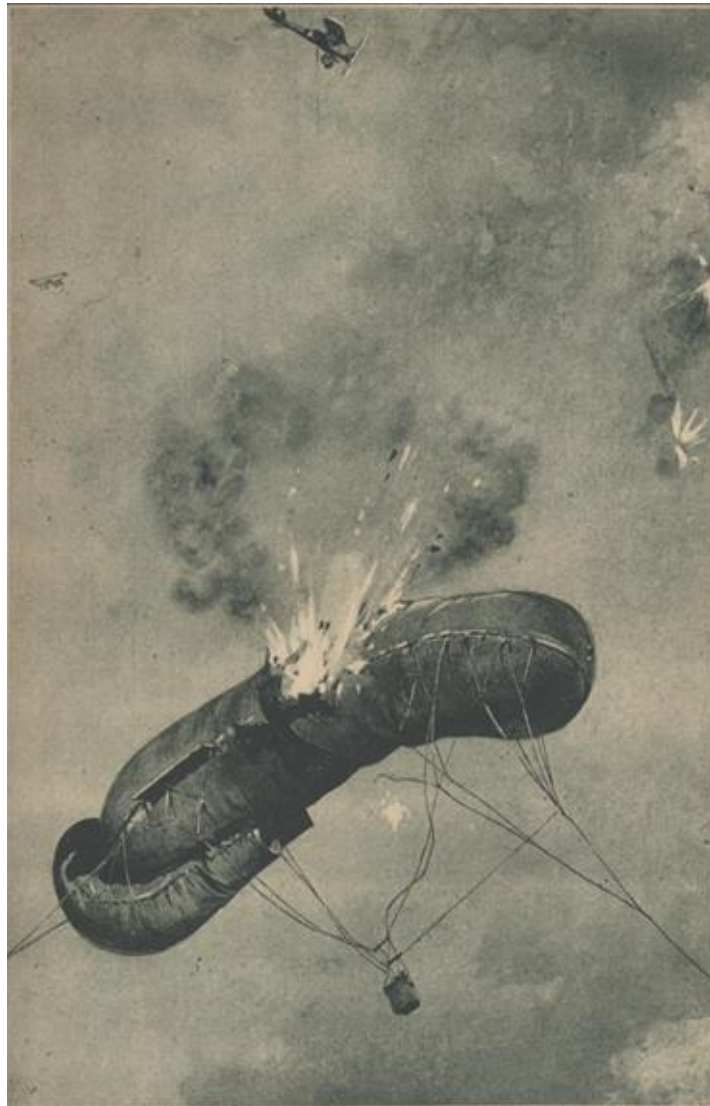
World War 1 air attack on observation balloon, 1 August 1916

From balloons we go to warships and Zeppelins - and much the same manufacturing advice applies, except that there actually is a commercial kit available to make the *Graf Zeppelin*. Obtainable from the Hawk Model Company of the USA, it is 38½ inches length. Next we arrive at the string- and-canvas days of pre-1914, when a country's air force consisted of a dozen or so oddly assorted types of aircraft in which brave men risked their lives. Oddly enough, no one seems to have manufactured a kit or model of the monoplane in which Bleriot flew the English Channel - but there are at least two kits available of the Wright biplane which made flying history at Kitty-hawk in 1903. They are the PA30 kit of Monogram and the Faller WR03 kit –its scale is not known, but the wing-span of the latter is 12cm.

The immortal Fred T. Jane[22], whose rules for fighting battles with model ships were the very first of their kind, added an amendment to them in 1912 -*Aerial Operations.* Jane allowed for dirigibles and for aircraft in the table given below:

	Dirigibles	Aircraft
	24 hours	6 hours

Scouting Speed	45 knots (15 squares)	90 knots (30 squares)
	33 knots (11 squares)	75 knots (25 squares)
	27 knots (9 squares)	60 knots (20 squares)
	21 knots (7 squares)	45 knots (15 squares)

To destroy either of these aircraft, Jane wrote in his rules that 1 hit in 3 destroyed a dirigible; any hit under 1,000 feet destroyed an aeroplane; 1 hit in 5 destroyed it at 2,000 feet and1hit in 15 at 3,000 feet and so on.

They could both drop bombs - a needle stuck into a cork dropped on the target from a height of 12 inches for every 1,000 feet of altitude. The dropping had to be simultaneous and spontaneous—with no aiming! Aeroplanes could carry two bombs and dirigibles more, by arrangement.

During the late 1890's and the early years of the twentieth century there were written and published many highly coloured and imaginative novels and books on invasions by air from hostile powers both of this world and from Outer Space! Perhaps the best of them were H. G. Wells's *The War in the Air* and *War of the Worlds*. In such books lies a multitude of ideas and inspirations for models and war games involving the most outlandish aircraft. Taken to a further stage, there is enough going on at the present time in the way of manned rockets and space flights to give originality to our plans. Perhaps we shall see Dr Who in a flying police box take on a horde of Daleks amid weird table-top terrain

4: World War I

Few will deny that probably t he period 1914-18 - World War I - presents the most colourful era for air wargames. It was then that the combat aircraft grew up, became transformed from a flimsy, nightmarish-looking affair held together with innumerable fragile wires into a sleek, streamlined and relatively fast, reliable aircraft. There was a resurgence of the chivalrous spirit displayed by the knights at their jousting; these young airmen lived short lives but fought and died to the most gentlemanly rules and customs of the whole war. Jeremy Hornsby, in the London *Daily Express* for 3 March 1962, just about summed it all up - this is what he wrote:

In a quiet back room of the Imperial War Museum they are getting together an exhibition which in May of that year was to mark the founding of the Royal Flying Corps fifty years ago. A collection of relics; memories of the days when men were still experimenting with the possibilities of flight….and fighting as they did so.

Among them, from dusty, forgotten Air Ministry files, were four combat reports written by young unnoticed pilots.

The men who, twenty-five years later - a little thicker round the waist, awe-inspiringly gold-braided and bemedalled, and remote in the stratosphere of High Command - were to be their country's heroes. The Air Marshals of Britain.

But then they were just ordinary pilots

Like that young man who at 12.15p.m. on August 27, 1917, was climbing to a height of 10,000 feet above northern France. A Captain A. T. Harris in a Sopwith Camel.

Suddenly, outlined against the muddy, shell-torn battleground of trenches far below, seven enemy planes appear. He stalls his plane, dives on to one of the enemy.

From 25 yards he pours a stream of machine-gun fire, forty rounds at a burst. The enemy plane is hit, and goes into a vertical dive, but the young man cannot follow it down to see its death because he has wheeled to attack a second.

Later he reports laconically: 'The wind was too strong to admit of us following them eastwards.'

Because he is flying a Sopwith Camel, and in these early dogfights above the bloody trenches a strong wind could overrule anyone's combat plans.

Even those of the pilot who became Marshal of the Royal Air Force Sir Arthur 'Bomber' Harris, whose fleets of Wellingtons and Lancasters were twenty-five years later to lambast the Nazi war machine.

It was in May 1917 that Captain J. C. Slessor, of No. 5 Squadron was taking photographs over Izel Hof and Gavrelle. Attacked by five enemy planes, he dived. Hit in eight places, he escaped, reported later: 'The escort consisting of Major Tyson and Captain Owen was found to be still above and behind us at the end of the combat.'

Today Marshal of the Royal Air Force Sir John Slessor recalls: 'If they hadn't been

there I wouldn't be talking to you now. They dived after us and forced the enemy away. I remember the incident well.

'Of course, bullets didn't harm an aircraft so much then. They just made holes in the fabric. But if you were forced to crash there were no parachutes, so you couldn't get out and walk as you can now.

A year before that, a certain Captain A. W. Tedder had just returned from a bombing raid. Seeing an enemy being attacked, he turned to join in, near the town of Douai.

Five hundred feet from the enemy, his observer fired a drum and a half from his Lewis gun, and Captain Tedder wheeled to attack two Fokkers who had been watching the action. One of them steered off, but the other held its course. At 200 yards Captain Tedder's observer opened fire.

The Fokker dived, viciously pursued by Tedder, who saw his tracer bullets slam into its fuselage and wings

Thirty-six years and another world war later Lord Tedder looks back with self-admitted nostalgia, and says: 'I think we learned a lot then.The fourth of those forgotten moments was recorded by a young lieutenant who can still remember in detail

Yesterday, Viscount Portal of Hungerford looked back to that day in November 1915 when, in their Morane Parasol, flying in formation, he and his pilot saw a Fokker rise towards them. Fighter planes were not anonymous then. They knew this plane's pilot was the German ace, a man of deadly skill in aerobatics, after whom the 'Immelmann turn' was named.

Says the now yellowed and dusty report: 'He opened his throttle….and dived to within about 20 yards of the Morane.'

Says Lord Portal: 'The reason Immelmann had to get so close was because he carried the one gun and not much ammunition. He had the advantage, though, that he could do 90-95 miles an hour, and all we could do was 85 flat out.

'The formation plan scared him away. I was very glad, because I had tried a few shots at him and my gun had jammed.

'But I carried a Winchester repeater and took pot-shots at them. The best I ever did was when we got above one and I blasted everything at him. I must have hit a radiator, because I got a lot of steam out of him. I didn't know whether he crashed, but I must have given him a fright.

'Perhaps that's why I remember it all so well, because we were all very frightened in those days. Somehow I escaped, I don't know how.'

He might not have done. Captains Tedder, Slessor and Harris might not have survived. And history might have been very different.

From the air wargamer's point of view, the rules for air games are probably more simple at this period than any other; there were fewer complications of speed and armament,

types of aircraft and capabilities to consider. But it seems more fitting to look at this period as a whole rather than as a detached air wargame - the glamour undoubtedly lies in the man-to-man dog-fights that made names like Richthofen, Ball[23], Immelmann, McCudden[24] and others into household words. It is claimed by numerous devotees of air wargaming that these dog-fights are almost impossible to reproduce on the table-top. They say that there are insuperable difficulties inherent in trying to duplicate combat which, more than any other type, made use of all three dimensions. A dog-fight such as took place during World War I could range from 20,000 feet right down to ground-level, and spread out over twenty square miles. The classic mix-up in the film *Hell's Angels*[25] serves as an excellent example of what could happen (even though it was specially kept 'tight' for the cameras) with aeroplanes scattered everywhere.

With that borne in mind, Bob Trimble of California - who seems to be impossible to leave out of these matters - has set down some highly ingenious ideas dealing with a World War I set-up. He writes: "You've got to remember that these ideas come from a professional airplane screw-ball who is concerned with the accurate use of planes, rather than a wargamer who works with them on the table-top and is familiar with the complications which arise when theories are put into practice. These ideas are aimed at the 1914-18 War, but can be fitted into any 'brush-fire' type of war right up until 1939." With the knowledge that any war-games set-up such as Bob Trimble attempts to formulate in the following pages is almost unique in its originality, let us turn back the calendar to about 1916. The ingenuity and natural creativeness of wargamers will take care of most of the problems encountered in moving into the air. They will find that most of their troubles have probably arisen from trying to go into the air war with later-model aircraft that are highly manoeuvrable, instead of learning on the slower birds. After all, how long would Bishop[26], McCudden, Ball, Lufbery[27], Rickenbacker[28] or von Richthofen have lasted if they had started flying SE5s, SPADs and Fokkers without having a backlog of experience gained on the more docile birds? So let us first consider our choice of aircraft.

WWI Dogfight- a 1/1444 Nieuport 17 and Albatross III by F-Toys. Photo by Tim Gow.

Reconnaissance and bomber aircraft will be the easiest to work into wargames and, as in

the case of actual operations, the most useful. If flashy manoeuvres, a la *Hell's Angels*, can be dispensed with, there is no reason why fighters cannot be used. Basically, recce types prowl around behind enemy lines, looking at things they aren't supposed to; bombers and artillery-observation types do various nasty things to mess up what the recces see; and fighters try to remove them or drive them off before that happens. Each job requires a special type of plane, so they shouldn't be used to do work they aren't suited for; in other words, a P/R type isn't used as a bomber, and so on. The aircraft chosen to be modelled have to be from the right period; for example a DH9A wouldn't be used with 1915 troops, and an Aviatik BII wouldn't appear during the Argonne Offensive. Suggest you use unarmed recce aircraft such as BE2 and the LVGBII, built to 1:72 scale. These aircraft could be used right on the table with 30mm troops. (Bear in mind that these aircraft are used in accordance with Bob Trimble's 'Suspension' method -described in the chapter dealing with the various ways of handling model aircraft in wargames).

Organisation of Aircraft

The size of the squadron is, of course, up to the individual, depending on how much time and work he wants to devote to the rather foreign sport of building model airplanes. Nine planes would be a practical number; they could be organised into three flights of three planes each, labelled (with a singular lack of originality) A, B and C (Red, Blue and Yellow respectively), complete with Squadron and Flight Commander pennons flying from the inter-plane struts of the proper aircraft. In actual practice the leader's wing man on the right flies slightly higher than the leader, the left wing man flying higher yet. This could be duplicated by making the wing men's respective wires half an inch and an inch shorter than the leader's, producing the stepped combat formation used for forty years by all air forces as their basic formation. A, B and C flights can be similarly stepped, the leaders of the right and left flights being again half an inch shorter (or higher) than Squadron Leader. Within the flight, the aircraft could be a wing-span apart; the separate flights being two spans apart when the whole squadron was up. For convenience sake it might be possible to use a piece of thin Perspex, triangular, with holes drilled at the proper points so that, the planes' wires fitted into their proper positions on the sheet, the flight could be moved as a whole; if this proved to be practical it would eliminate two-thirds of the work, at least, since it would not be necessary to shove nine or more individuals around from line to line. If aircraft were destroyed by ground fire or enemy fighters they could be removed, by creating a realistic appearance as the survivors ploughed along with gaps in their formations.

All aircraft will have to come from some base which must be close enough to the lines to allow them to make the most of their time in the air. All the models will be capable of making a certain number of moves, which is logical, and the distance from their base to the target has to be figured in, as does the length of the move, which will vary according to the speed of the prototypes. If only for show purposes the bases should be completely modelled, with hangars, barracks (or a commandeered *estaminet* [29] or *chateau* (Chateau Briand [30], perhaps?), and AA, either machine guns or light flak cannon. To simplify matters, a number of squadrons would share the same aerodrome, so this actual practice

will cut down on the window-dressing considerably; two aerodromes might take care of an entire air force if its operator wasn't willing to spend all his time building model planes to the exclusion of his ground force.

Unless you're an aeroplane fanatic all this work would be less than enjoyable if it just produced a batch of colourful models which served as window-dressing for the troops and terrain of your land wargame. To prevent this happening your air movements and your land manoeuvres must be coordinated (this entails knowing something about land wargames, as described, for example, in *War Games* by Donald F. Featherstone, Stanley Paul & Co. Ltd, London, 1962).

To keep them from being just window-dressing, sliding curtains would be stretched across the table behind both sides' front lines (not down the centre, as the area which contained the front-line trenches and No-Man's-Land was usually shallow enough to allow both sides to keep tabs on the enemy activity at all times). Moves would be simultaneous behind the curtains, which would be drawn back when the moves were completed. Then periscopes would be used to check the changes made by both sides. Here is where the aircraft would come in. If a spotter could be put up, the curtains on the enemy's side would be pulled back and his opponent could look right down his throat, even moving his planes over the enemy territory. If both sides had planes up, then the curtains would be back on both sides of the lines. When they were forced to return to their own bases the curtains would be pulled closed again; they would also be closed if the planes were destroyed by ground fire from actual model AA guns on the table (their range being so short to preclude off-the table firing).

All units a move or more behind the reserve line of trenches would be represented by 3 x 5 cards, face down. The units they took the place of would be described fully on the face, the units themselves being stored off the table. When an enemy recce plane flew over them, provided it was equipped with cameras, the cards would be in effect frozen directly under the plane's line of flight in a strip one move (infantry) wide, if the plane was making a straight photo run only, not if it just happened to pass overhead. To confuse matters for your opponent, at least an equal number of blank cards would be mixed in with the actual units, all of them in positions which look like possible. Since recce planes can't carry an unlimited number of plates they will be able to make only three straight 2-foot runs at most, two if they are making runs deep behind the lines. The planes could be limited to five moves, two to get in; one for the actual run, figuring in the distance required to reverse directions or many any other changes; and two to get out and back to its base are the 'frozen' cards face up; if the plane or planes are destroyed or forced down, then naturally nothing is revealed.

The units mentioned previously would only appear on the table when they moved up into the front-line area or when they were exposed by recce planes; in this case they would be placed on the table in place of the card that represented them and moved normally from then on.

Artillery-observation planes will fly back and forth over the lines to adjust fire from batteries, so the number of guns per side may have to be stepped up to allow for ranging

fire, all pieces firing on the same points.

Bombers obviously will attack troop concentrations, railheads, convoys, artillery and 'targets of opportunity'.

Obviously nothing is going to stand still on a battlefield while a PR plane flies back to its base, so these birds would fly missions to spot large build-ups, artillery positions and so on, targets that would remain fairly stable. The artillery-observation planes would be sending back to their control points directly by W/T, so the cards directly under their flight paths would be turned over as soon as they came overhead and would remain this way (face up) until the plane was knocked down or left the area. Airfix makes an RE8 kit which makes up into a fair model of the plane, but considering it's the only one available, and that most war-gamers are not about to turn into airplane modellers overnight, it will have to do.

Kite Balloons

The distance each side could see behind the enemy lines could be increased a full infantry move through the use of kite balloons. These would also hang from the net, but for realism's sake would have lines to the ground, weighted by a model ship winch, an accessory which should be available from any good hobby shop. The larger sizes would probably be the best to use, resting on either a platform made from HO/OO timber or on a truck, modified to resemble the actual winch trucks. These balloons would be protected by machine-gun crews, light-flak cannon and mortars, and possibly a flight of fighters based nearby; but if they could be destroyed, then the troops or equipment otherwise exposed could be removed and the anonymous 3x5 cards put in their place, along with the blank decoys. These balloons could be made from plastic sheet, heated and stretched over a wood form, a method which would work both for the main bag and the fins, which would have to be in separate pieces. Glued together, the seams filled and sanded, and sprayed light grey, all they would need would be a basket and two observers.

To knock them down, model planes on special hooks, hanging 2 inches above the kite's level and equipped either with Le Prieur rockets or long belts of incendiary ammunition would have to be used. Here is where a little care with the paint job could produce Frank Luke[31], Willy Coppens[32] and Heinz Gontermann[33], the kings of the balloon-flamers.

Close air support over a World War I attack, date unknown. Photo source Donald Featherstone.

Trench Strafing

Trench strafing and ground attack can be carried out either by the special types - Halberstadts and Sopwiths - developed for this work or by regular planes carrying Coopers or the German equivalents, again hanging from special long wires. The kite-burners would have to be worked solo, but these strafers could be used in line astern or abreast with no trouble, and would be particularly effective against advancing troops, motor convoys and cavalry or horse-drawn artillery columns.

Anti-aircraft Defences

During the 1914-1918 War everything from .303 machine guns on up were used against aircraft, so the field is wide open when it comes to setting up AA defences. 37 mm mounted on trucks, 105 mm, 77 mm for the Germans, from the movies 75 mm nosed up on ramps, and the inevitable machine guns mounted singly or doubly on wagon wheels, tripods and proper heavy-duty mounts are all available as prototypes, even if some of them aren't accurate. A couple of machine guns yoked together and swivelling on a wheel would make a serviceable light AA mount for use either by line troops or as aerodrome defences.

Cannon-fire would be represented by smoke-bursts - puffs of cotton, tinted brown-grey, with thinned-out oil paint and glued to wires. The vertical range would extend to the net, with a horizontal range 18 inches in diameter, centred over the gun itself. In use, the smoke-bursts would be hung above the guns, either in clusters or strung out. This will not be a cook-book process, though, since the aircraft can change course at any time. Since both the plane's move and the placement of the flak-bursts have to be figured out before the move is actually made, then hung up simultaneously, a plane could turn away from ground fire or fly right into it. If bracketed or right on top of the bursts the plane would be destroyed; if close it would only be damaged; the severity could be figured out with dice or, again, tables of some sort, the plane either crashing in the immediate area or making it behind its own lines. Either way, a crashed plane would have its cameras destroyed along

with the plates, so again the frozen cards would not be uncovered.

Plane v. Plane

Inevitably, someone would realise that enemy aircraft, possibly out of range of any artillery, were costing him troops and chances for massing troops for attack. So one day he would send up a plane with a machine gun, rifle, shot-gun or some such nasty little customer for the observer to use against the enemy spotters that they had been passing every day and waving at. By the time that happened, and set off a programme of building new planes specifically designed to do the job, both sides would probably have got used to working with aircraft and would have worked out methods of manoeuvring. As airplanes would probably begin by making straight passes at each other while firing, the scoring and determining of shots could be worked out (the planes being too slow and unwieldy to do much in the way of evasive action or of making elaborate attacks).

Fighters will be able to attack any planes within an inch of their particular altitude, head-on, beam, from astern. If the target is an inch or less below the fighter when it makes a diving attack and is exposed to fire from the gunner; if above, then it makes a belly attack and, unless it's going against a Gotha with its belly tunnel or a SSW R-plane, it is safe from return fire. Of course, if the plane is one of a formation its buddies are blasting away with up to sixteen free machine guns, which, like the fighter's fixed guns, have a range of 12 inches in all clear directions. It might be practical, if not in scale, to fasten pieces of light wire to the cowlings and gun mounts of the planes, marked off with dots of white or yellow paint and painted light brown-grey to simulate tracers and the smoke trails they leave. Dice or fire tables can be used to determine the damage to all parties involved in one of these hassles.

British The Vickers F.B.16 fighter, date unknown. Photo source Ministry of Defence

Destroyed Aircraft

When a plane is destroyed, whether by ground fire or enemy aircraft, a wreck should be placed on the table at that point and the model itself removed, to wind up in the replacement pool after its serial number has been changed and the squadron marking painted over. After two moves the wreck would be considered as shot apart, also removed, and stored where it would be handy for the next crash.

5: World War II

Readers of the author's initial book on the hobby (*War Games)* will have read of the wargames of World War II period fought by Lionel Tarr of Bristol, England. In the book are a set of the original rules used by Mr Tarr for his land wargaming. Obviously it is difficult to reproduce realistically what occurred in 1939-1945 without including the use of aircraft. Lionel Tarr seems to have handled this problem very adequately, as his own words tell us:

My order of campaign was first planned as an invasion, my objective Moscow. I used a series of maps reproduced in various books written about the war in Russia and drew a comprehensive map showing towns and rivers and roadways up to Stalingrad (this is my first major target). Then I drew a series of maps scaled to take me over some '50 sand-tables' of terrain which became my operations map. Upon this I move my armies by coloured mapping pins. These maps are squared off in infantry moves, but as my troops are mainly mobile, I move quite rapidly upon the highways available, whenever two opposing forces enter an area small enough to be reproduced upon the table, that I do, and fight out the action upon it. I allow 24 hours to elapse before continuing my map moves, hours being in effect moves on the table. My aircraft are always based upon the map and the flights are 'mapped' until the aircraft arrive over the table, then they are controlled by a certain number of moves and upon completion of these moves have to depart for 'home', whether or not their mission has been accomplished.

With regards to my aircraft control, I have reverted to the net again, and as each plane operates on a calibrated stick or rod, this enables operational heights to be realised, and tank hunters like the Typhoon (lease-lend) and Stuka Ju87 to strike from tree-top level; one can also reproduce the shooting up of convoys and positions with much more certainty. I only use the tactical aircraft now with Transports as the one exception. High-level Reconnaisance, Heavy Bombers and the like are out.

All aircraft have operational ranges, and scaled to the ground scale eliminates the situation of everlasting petrol or at the other extreme elastic-band motive power. Strikes are also limited to the amount of bombs, shells, etc., carried. This in itself makes aerial combat a most interesting game; one can, if one is not careful, find oneself becoming in spirit the pilot of one plane stalking a tank for instance, to the detriment of the troops upon the ground.

Generally speaking, here are my methods of air control and manipulation in conjunction with land wargames.

Although the greater the height from terrain to 'maximum operational ceiling' the better results will be achieved, this method can be carried out in as short a distance as 3 feet.

1/1200 scale Tu-16 'Badger' bombers on anti-shipping mission. The planes are mounted on a simple weighted base. Photo by Tim Gow.

First– establish the maximum operational ceiling with the erection of a net; this can be made with button thread, or purchased, with mesh of some 3 inch square or less. This to be fixed rigidly above terrain *and* to extend if possible over whole room.

Second–-fit each airplane with a line (either thread or nylon fishing tackle nose *and* tail, the lengths of which are determined by the distance of the gap between the ceiling net and 'scaled' 100 feet above terrain to each line affix a hook (for engaging net).

To use– Fasten lead hook (one fixed to nose line) in net above target (or as near position immediately above target as is possible) and hook on tail line to engage net as far off table as possible. Under ideal set-up this will hold aircraft close to netting off table area. To *operate* disengage tail-line hook and advance correct move distance along netting towards nose-line hook and reengage netting. *Effec*t is to move plane into operations area over table in position of attacking dive. Further moves bring plane closer to target and constantly diving towards attack area, when both hooks are in the same area plane is in horizontal position over target. Following moves will be by nose-line hook in place of tail-line hook, in order that plane now begins ascent from delivery point of bomb, rocket or machine-gun burst.

It will become apparent to the operator that variants to this basic operation will enable fighters to engage each other as well as bombers, etc., and continual variance of heights adds to the aerobatics that can be performed. As the majority of planes used in a wargame are ground-attack planes or fighter aircraft, this means a pin-pointing of given targets and constantly changing altitudes can be readily be achieved.

To aid me in getting things right, I have for a long time used a sighting periscope (described fully in *War Games*). This works in reverse to the normal type, it is made to give one a view from 'ground level'. As all gamers know, standing poised over one's table enables one to view the entire enemy force without interruption; and many movements are made which would not have been made had the opposing force been unseen, so everything

has to be done from the level of the terrain (except where spotter craft are used). All artillery fire must be observed (i.e. by trained observers). The periscope is placed in close proximity of the actual piece and what can be seen in the glass is what can be acted on only; the same method is used for any firing, and enables men to use natural cover such as the folds in undulating ground with greater success, it also makes a commander place his troops in such positions as to cover such areas with adequate fire-power.
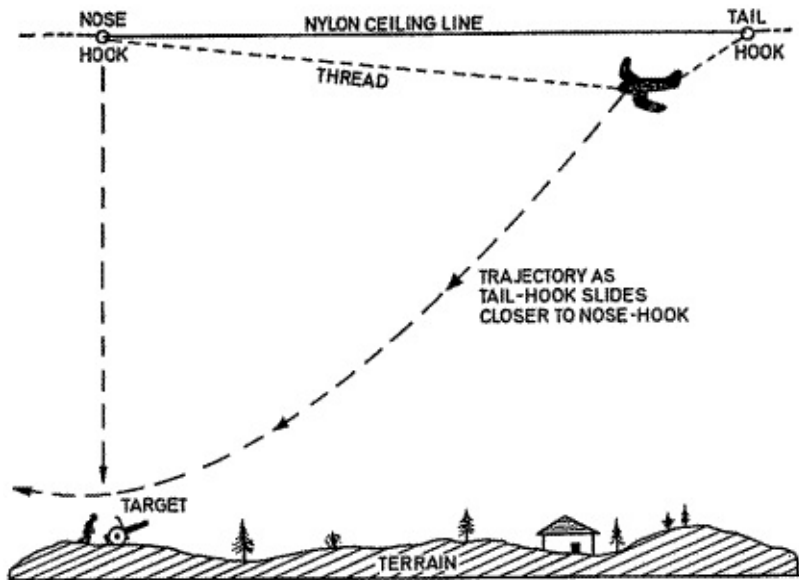
FIG 1 A simple-to construct and easily worked 'over the table' method of suspending model aircraft.

Readers will find it advantageous to read this chapter in conjunction with the full list of the Tarr rules in the book *War Games*. However, it is considered advisable to reproduce here some relevant extracts from those rules that are particularly applicable to aircraft in wargames.

Visibility: At commencement of battle throw dice for wind (already covered) and for visibility. These situations decided by dice prevail throughout that particular battle. Dice throw of 1 or 2 means rainy, overcast conditions; throw of 3 or 4 means normal conditions; throw of 5 or 6 means bright, sunny day. If rainy and overcast, throw dice again: 1 or 2 means visibility of 28 inches; 3 or 4 means visibility of 34 inches; 5 or6 means visibility of 60 inches.

Moves Distances:

Fighter Aircraft	36 inches	6 moves over table
Tactical Bomber	24 inches	5 moves over table
Heavy Bomber	24 inches	8 moves over table
Transports	24 inches	8 moves over table

Material Damage:

To determine material damage the following point system is used. All weapons have a *points strike value* depending on their calibre or power and all appropriate material has a *points defence value* based on strength and speed of moving vehicle, for example. To

decide whether a hit has been scored, three dice are thrown by firer simultaneously, their total score PLUS the particular weapon's *strike value* must equal or exceed the *points defence value* to destroy that objective. Thus, a fighter aircraft with a strike-value of 6 is trying to hit a medium-heavy bomber with a defence-value of 22. The fighter throws its three dice and scores 5+5+6 = 16 plus its strike-value of 6 gives him 22 also - so he has destroyed the medium-heavy bomber.

Individual targets attacked from the air carry a maximum points value of 20, but a town as a whole, only has its normal defence value.

> Defence
>
> Soft Vehicles (lorries, etc.) 7
>
> Buildings 7
>
> Reinforced Blockhouses 18

All armoured vehicles have defence points for their thicker frontal armour when hit (plus 2 points). They lose 2 points when hit on the side and lose 3 points when hit in the rear.

Air strikes:

Individual targets attacked from the air carry a defence points value of 20 - a dice throw that scores below this figure means a miss of 6 inches and a burst pattern is used to ascertain casualties. Troops inside buildings hit by bombs are considered killed. Troops shot-up from the air suffer normal casualties.

Burst Patterns:

This is a circle of card or Perspex of a specified diameter (according to weapon concerned) which is placed over the point of impact when a hit is scored. Everything or everyone within that circle is considered hit. Sizes of circles are as follows:

Heavy Bomb   6 inches Tactical Bomb   5 inches

Weapon Value

Weapon	Range	Strike Value
Light Machine Gun	15 inches	3
Heavy Machine Gun	18 inches	4
Twin-barrelled Machine Gun	18 inches	5
Aircraft Machine Gun	18 inches	4
Aircraft Cannon	18 inches	5
88 mm AA Gun	40inches	5

	Strike Value	Defence Value

Fighter Aircraft	6	22
Tactical Bomber	6	20
Medium Heavy Bomber	10	22
Heavy Tank		16
Medium Tank		15
Light Tank		14
Armoured Car		13

Bombers Hit:

When loaded up and hit, a bomber can either blow up or jettison its load. One die decides: 1 to 3 it jettisons; 4 to 6 it blows up. When jettisoning - if by a Stuka the bomb is dropped immediately under where plane is hit, if by medium/heavy bomber bombs drop in line directly along route of aircraft. To decide position, a marker is dropped from bomb-bay under plane, from point where this marker touches ground measure 8 inches and this is the position of last bomb, casualties decided by dice and burst pattern based on strike value.

Paratroops:

The use of paratroops or glider-borne troops is subject to the following conditions:

1. Eighteen men per aircraft.

2. One piece of equipment (i.e. gun and limber, light truck and crew, etc.) per glider.

3. Paratroops land on dropping zone and gliders on landing zone *en masse* and not deployed. They cannot fire whilst dropping and dropping itself counts as one move. Paratroop transports when hit by flak are brought down and one die is thrown for every six men on board - the number thrown represents paratroops who are uninjured and bale out as per condition 3 above. Gliders hit and brought down also include troops not fitted with parachutes.

Bob Trimble of the USA has figured largely in these pages - he has got his own ideas on the use of aircraft:

World War II Ground Attack

As with the World War I, the aircraft will have a piece of wire fastened to it, in this case running through the fuselage as its balance point rather than through the top wing. Since enough different types are available in kit form to cover everything from close support to strategic bombing, the lengths will have to vary according to the mission; since a good many types of aircraft were used for both high- and low-level attacks, a piece of nylon line with a loop at one end and the other made fast to a hook could be used to drop the models down for ground strafing. Single-engined types can carry rockets, bombs and napalm tanks, so these will all have to be modelled or pirated from other kits, and hung on the models according to the strike. A short piece of wire bent into a flattened 'U' and glued along the top of the stores, fitting into holes drilled at the proper attachment points, would

allow these stores to be changed at will. (This would apply, naturally, to the Mosquito and Beaufighter.) With World War II aircraft there is no leeway with colour schemes; these will have to be accurate, but there is still a considerable variety of actual markings to choose from.

On the actual missions the aircraft will make their runs in to the target and release, with no allowances needed for hits or misses. World War II pilots had this worked out to a fine art on all sides, so there is no need to confuse matters. Flak is going to be a major factor to contend with, however, due to the increased use of automatic weapons, from .30 to 20 mm especially. The Germans were particularly fond of auto flak guns, so this will have to be allowed for. The method of indicating bursts would be the same as for World War I, put up in strings, clusters or any pattern the actual guns used.

Again the planes should have to come from an airfield, both for show and to allow for retaliatory strikes; this will also serve as a storage area to keep planes out of the way.

1/300 scale air landing. Horsa gliders have already landed, while the second wave arrives in C-47 Dakotas. Heroics and Ros models. Photo by Tim Gow.

Paratroops and Glider-borne Troops

This is a phase I hadn't originally planned to go into, but since airplanes of one sort or another are used, here are more theories. Wire hooks are used (one might cause models to yaw continually; setting one into the top wing or fuselage at about a third of the chord, and another into the fuselage near the tail would stop this, though it might make the individual models harder to move), again the length depending on the altitude. For gliders the nylon line would have to be used to allow them to coast to the ground. Since these would only be used once during a particular landing, and remain on the table where they touched down, a fair number might have to be made if operations of any size were planned. *The Longest Day*[34] demonstrated the use of these planes excellently, so the only suggestion I would make would be to figure a 4-foot run into the objective. Two lights would make it

possible, by painting one with a thick coat of blue, to simulate night ops, when these planes were most effective. Night fighters and bomber missions could also be worked in, quite possibly with considerable success. Consider, for example, Schnaufer[35] who finished the war flying a Bf110G and was credited with121 kills. Paratroops could be dropped along a 2-foot line, both these and the glider troops going into action on the same move that they land, but not operating as organised units until the next. Again, Ryan's story, both the book and the movie, describe this sort of fighting - small units scattered behind enemy lines and trying to get together - in detail. Besides, airborne troops of all countries make fascinating additions to the armies because of their unique uniforms.

Tank Busting

For this purpose rocket-firing aircraft are indispensable, with the exception of the Germans' Ju87G, which packed two 37mm cannon under the wings. As with any other ground target, a straight run-in on the deck would be carried out, the rockets or other weapons (Tigers were knocked out in Belgium by the Thunderbolt's eight .50s) would be fired a foot from the target, and a hit or miss thrown for or otherwise determined.

Alan Colquhoun has devised interesting rules for this period also:

Firstly the air side to a World War II wargame, invented primarily to include rocket-firing aircraft and airborne troops.

Time/Distance:

Aircraft limited in advance to number of turns they can stay in the air. Distance to battlefield from base also decided in advance, likewise refuelling the arming time and repair time (example - FW190 can stay up five moves: one move base to patrol area, three on patrol, one home, one turn to refuel or three to repair).

Air Fighting

Each aircraft can make one air attack per turn. Target specified throw two dice.

Fighter/Fighter	11 or 12 destroys	9, 10 damages
Fighter/Fighter -Bomber (carrying ground-attack weapons – bombs etc.)	10, 11 or 12 destroys	7. 8. 9 damages
Fighter/Bomber or Fighter -Bomber attacking ground forces etc, (similar special rules for Stukas, gliders etc, as required)	9, 10, 11 or 12 destroys	7, 8 damages
Bomber/Fighter	12 destroys	10, 11 damages

Ground Attack: Two attacks per turn. Rules for A/Tank guns, (e.g. attacked target must be visible and attackable), 3, 4, 5, 6 on one die destroys soft-skinned vehicle, 4, 5, 6 tanks, 5, 6 heavy tanks, etc.

Ground Bombardment: As for artillery barrage. Bomb load equate to fire of so many

guns, e.g. Mosquito equals fire of 8 x 25 pounders for one turn. It therefore 'pins down' all enemy in box 2 ft x 2 ft attacked for two turns (if enemy moves heavy penalties – it doesn't move or take part in game – no loss). A hit is decided by dice and varies with altitude – whether bombs fall over or short decided by further throw, even shot, odd over, by one measure. Over 10,000 1, 2, 3 is win, etc.).

The hit, short or over rule applies also to airborne drops, but a second die is used and if they win they can be up to 6 feet out.

Ant-aircraft Fire: Rules for hit and win at low level on one gun, one throw for light flak at low depending on your assessment. Over 5,000 feet only by battery-fire of four guns – one throw – 12 destroys; 10, 11 damages (damaged

6: Model Aircraft in Land War Games

Whist there may well be considerable numbers of air enthusiasts who will enjoy fighting battles solely with model aircraft, there are probably more wargamers who will combine air operations with their land wargaming. A leading British exponent of this facet of the hobby is Lionel Tarr, who is mentioned at considerable length elsewhere in this book and in *War Games*. Similarly, Ron Miles of Southampton has gone very thoroughly into the combining of air and land warfare (*circa* World War II), and has kindly given permission for his rules to be reproduced herein.

1.   *Method of Operating Aircraft*

An area of 1-inch chicken wire is stretched tightly above the wargames table at a height of 3ft 6in to 4ft. Each aircraft model is loosely looped at nose and tail with a 15-inch length of cotton. Plastic sprues of varying lengths are bent into hooks at each end, one of which is hooked over the wire mesh above, whilst the cotton is doubled and looped over the other so that the aircraft is slung underneath. It is possible, by careful manipulation, to put the aircraft into a dive, to side-slip, roll or climb - the height being adjusted by varying lengths of sprue.

2.   *Rules for Operation of Aircraft*

These rules are basically intended for use in campaigns rather than in single battles. They are also calculated to fit in with a wargames table 12ft x 6ft in size. Mr Miles uses a *strike defence* points system, similar to that of Mr Tarr.

Type	Speed (in inches)	Duration over Table	Points Carrying Value	Strike Value	Defence Value
Fighter	40	8	4	1 per machine gun 2 per cannon 3 per rocket	19
Fighter-Bomber	36	10	8		17
Medium Bomber	28	12	18		19
Dive-Bomber	26	10	12		17
Heavy Bomber	24	15	24		20
Recce Plane	30	12	–		22
Spotter Plane	20	15	–		22
Transport	24	15	20		20
glider	Same as Towing Plane		20		20

A pair of elderly Ju-87 attack British troops near the Corinth Canal

Variations on types, etc., can be worked out, using this table as a basis.

All aircraft *must* move every move and may throttle down to three-quarter speed; spotter planes may throttle back to half-speed.

All aircraft add 6 inches to their move-distance in a dive and deduct 6 inches when climbing.

Bombing

Bombs have points value:

Heavy Bomb = 6 points

Medium Bomb = 4 points

Light Bomb = 2 points

- Medium bombers may not carry heavy bombs.

- Stuka dive-bombers carry one medium bomb and four light bombs.

- Fighters carrying an underslung bomb may jettison if attacked (even when over their own troops). The fighter, when jettisoning, must reduce its speed to that of the fighter-bomber and deduct 2 inches more from rate of climb

- To hit a designated target - throw a die:

  1 = Bomb lands 6 inches *short* of target

  2 = Bomb lands 6 inches *left* of target

  3   }   = Target hit

  4   }

5 = Bomb lands 6 inches *right* of target

6 = Bomb lands 6 inches over target

To decide if target has been destroyed - three dice are thrown and their total score, plus the strike value, must equal or exceed the defence points value of any material within a 'burst circle' laid exactly with its centre over point at which bomb struck.

Burst Circles:

Heavy Bombs	= 4 inches
Medium Bombs	=3 inches
Light Bombs	= 2 inches

Air to Ground

Ranges:

Machine guns	=18 inches
Cannon	= 20 inches
Rockets	= 24 inches

Then throw dice:

At long range, need 6 to score a hit

At ¾ range, need 5 or 6 to score a hit

At ½ range need 4, 5 or 6 to score a hit

At ¼ range, need 3, 4, 5 or 6 to score a hit

When strafing vehicles - use their strike and defence values in accordance with charts. [AUTHOR'S NOTE: This can be readily understood if the charts of Mr Tarr are consulted (given in *War Games*).]

Personnel who are thus shot-up have casualties in the same way as for land wargames - but add an extra one to their 'saving throw' (again fully explained in *War Games*)

Air to Air

A fighter attacking another fighter from its rear adds *two* to attacker's *strike value.*

Attacking a bomber from a 'blind spot', or if rear-gunner of bomber is dead, adds *two* to attacker's strike value.

Bombers in formation which can bring separate guns to bear on an attacker will throw dice separately to score hits but will add together their strike-values.

Thus; three bombers in 'V' formation attacked by a fighter from behind and/or above bring each rear-gunner to bear. Two of them score hits with one machine gun each—this means that the strike value will be 2 plus 3 dice.

If a hit has been obtained but the aircraft is not destroyed, then the attacker must throw on dice 5 or 6 to hit a crew member (who has saving throw of 4, 5 or 6)

When the pilot is killed in a multi-crew plane, a fifty-fifty chance is given of another crew member taking over. If it fails, the plane crashes.

Anti-Aircraft Defence

Gun	Range (inches)	Strike	Defence
37 mm	55	6	12
88 mm	50	5	12
40 mm	30	3	12
MMG	15	2	Crew
LMG	12	1	Crew
12 – 20 mm	24	2	12

Firing takes place under normal rules.

Dice throw:

5 or 6 = A hit at ¾ to full range

4, 5 or 6 = A hit at ½ to ¾ range

3, 4, 5 or 6 = A hit at ¼ to ½ range

To destroy an aircraft—throw three dice and add to their score the *strike value* of the particular weapon. The total has to equal or exceed the *defence points* of the aircraft to destroy it.

When a hit on an aircraft is obtained by small weapons the crew are considered as casualties in the same way as for air-air combat.

When an aircraft is shot down it continues its line of flight at 45 degrees until it reaches the ground. At that stage a decision is reached as to the damage caused to the aircraft and casualties among its crew. For example, if the aircraft is carrying bombs which it has not had time to drop it is considered to be a fifty-fifty chance that they will explode when the plane crashes.

Spotter Aircraft

When this type of aircraft are controlling gun-fire they must always be facing or half-facing the target at the time of ranging and firing.

This means that they will have to fly an almost predictable course and will have to use a periscope to observe. This also applies to reconnaissance aircraft.

Paratroops and supply

A Ju52 may carry sixteen men and two ammunition canisters; and it can also tow up to

three gliders at a time.

Historical accuracy indicates that German paratroops were unarmed when dropped (except officers who carried pistols) and sufficient weapons to arm the whole stick were dropped in two canisters with them. On landing, the troops made their way to these canisters and armed themselves. Mr Miles (having had a bitter experience in a wargame with unarmed paratroops) prefers his to drop armed and only *extra* supplies dropped in canisters.

All men and canisters are represented by marked counters placed in a matchbox. When the dropping zone is reached this box is dropped as a moving stick so that the men are not deployed (which takes up one move)

On first landing paratroops, in range of defending forces, must take a round of fire without return; but they will have an extra one added to their saving throw. After that they fight as normal infantry except that they are given high morale ratings for the first eight moves (adding on to all morale dice throws during this period). They may also carry on fighting for the same period if they lose all their officers.

A man landing off the table is considered lost and takes no part in the action. Any man dropping in a minefield will be considered to have detonated a mine and is killed without a saving throw. A die throw of 5 or 6 is required to save a man from drowning if he falls into the sea, a river or a lake. If a 5 is thrown, he climbs out to the left bank; a 6 means the right bank and he will be unarmed.

When a transport aircraft is hit and brought down, every man needs a throw of 5 or 6 to save him.

Gliders

Gliders may carry light anti-tank guns, jeeps and trailers and other heavy equipment. There is a carrying capacity of 20 points per glider and respective points values of items are as follows:

A = 1 point

Light anti-tank gun = 7 points

Jeep =10 points

Trailer= 6 points

Mortar= 2 pints

Ammunition, fuel and ration containers= 2 points each

On being released, gliders have only very limited control; this means that they must be on the ground that move. The area in which they touch-down is divided into six squares, and a die throw will decide into which square a glider lands (or crashes). Obstacles in the glider's path will be safely negotiated by the glider on throwing 4, 5 or 6.

If touch-down is satisfactory, troops will disembark in one move. Should the glider

crash into an obstacle, all men and equipment contained within it will need a die throw of 4, 5 or 6 to survive. If a glider lands in a river, lake or the sea, all equipment will be lost and men need die throws to save themselves by swimming ashore. Gliders touching down in minefields will automatically detonate mines that destroy glider and equipment; men need 5 or 6 to survive.

Supply Dropping

Supplies are dropped in the same way as paratroops - in containers marked with identifying coloured markings to fit in with the following Troop Identification System:

Rifleman   Yellow

Grenade- throwers Red–marked G

Bazooka-men Red—marked B Flame-throwers

Red–marked F

Officers Blue

LMG operators Green–marked L MMG operators

Green–marked M

Wireless operators Green–marked W

Engineers   Green–marked E

Other specialist troops marked accordingly.

When the 'stick' is in its 'matchbox' (with everything represented by counters, these counters are as marked as above; canisters are marked blue with a gold cross).

As the author writes these rules from Mr. Miles's folder, it certainly appears that they form the nucleus of a very ingenious and workable method of representing airborne operations on the table-top. Suffice to say that they are compiled with a considerable amount of practical experimentation, and so far as Ron Miles is concerned, they work!

7: Aircraft at Sea

Up to and including World War I the big gun was the weapon that ruled the seas, but during the last war the superiority of air power soon became obvious, and this was demonstrated by many of the battles in the Pacific War. To translate this to the wargames table is not too difficult.

Aircraft are divided into six general types:

a)   *Heavy Bombers*. These are land-based types (e.g. Lancaster, B17 Flying Fortress) and carry heavy payloads

b)   *Medium Bombers*. These may be land-based or from carriers, and are used for launching high-level bombing attacks on warships. Included in this section are dive-bombers (such as Stukas or Barracudas).

c)   *Fighter-Bombers*. These are lighter bombers which are also able to take the part of fighters.

d)   *Fighters*. These are the most important aircraft, and are as protection against enemy aircraft, for armadas of bombers in action.

e)   *Torpedo Aircraft*. Perhaps the most decisive, if not powerful, of the naval aircraft.

f)   *Seaplanes*. These, used for anti-submarine actions, are either based at port or can be carried on special seaplane carriers.

Aircraft may be mobilised by any admiral at any time he wishes, and it will be clearly seen that one will find aircraft carriers on the wargames table very rarely. The ranges of various types of aircraft may be found fairly easily, together with their speeds. Air strikes will normally be carried out by map, and the course of the strike force may be easily drawn out, and the strike accomplished. Air attack is simulated by means of the striker on the plan and side elevation, according to these rules.

This method, devised by the famous Fred T. Jane, needs a needle stuck into a cork and then dropped from a scaled height (thus, if 1 inch= 100ft of altitude the cork would be dropped from 8 feet 4 inches if the aircraft were flying at 10,000 feet). This projectile is dropped on to a paper silhouette of the ship laid on the table or floor.

1.   For high level bombing strike the plan of the target ship. If the bomb will penetrate (according to a bomb armour-piercing scale) the armoured deck, then the upper deck is devastated, and so on, as for normal ship-to- ship shelling. Hits may also be computed in the manner devised by Fletcher Pratt (see Chapter 8).

2.   For torpedo bombing use the striker on and below the water-line: any contact point above the water-line is null and void. If torpedoes hit they invariably penetrate - even the huge armour of the *Musashi* and *Yamato* battleships are vulnerable. Torpedoes can smash engines, steering, destroy magazines and open great rents and render the ship in a sinking position.

Such a method of bombing may also be used to simulate raids over land or to indicate

whether a stick of paratroopers has landed in their dropping zone.

David Gibbons, English naval wargamer, has \a simpler method of handling aircraft at sea - his rules are as follows:

All aircraft divided into:

> a) Torpedo planes

> b) Bombers or

> c) Fighter-bombers

a) Torpedo Attack

Throw a die for every two planes. 6 to hit ship. Then throw for nature of hit:

> 1 = Water-line–half-speed

> 2 = Engines–half-speed

> 3 = Steering

> 4= Water-line–lists, moves every other go at half-speed

> 5= Stopped dead

> 6= Magazine ignited– ship sunk

b) Bombers (ship-borne only)

Throw a die for every two planes. 5 or 6 to hit ship. Then throw for nature of hit:

> 1 = Sec. Turret battleship (i.e.—6 inches)

> 2 = Heavy Turret (11 inches)

> 3= Penetration—stopped dead

> 4= Medium turret (6 inches—10 inches)

> 5= Engines–half speed

> 6= Water-line–half speed

c) Fighter-bombers   6 to hit. Scores hits same as bombers.

Counter-attack and defence:

Each ship throws one dice (special AA ships two) and if they get 5 or 6, one plane is shot down.

Fighters may attack enemy - then straight fight - loser is shot down (i.e. A throws 4, B throws 5 - A is shot down). This is done when half enemy have attacked. Then planes return to their carriers.

David Bradley has obviously gone to considerable pains to work out his rules for the use of aircraft at sea - here they are:

a) CARRIER AIRCRAFT

Types

1.Fighters

2. Bombers (torpedo, dive and anti-submarine)

Number on Carrier   Total

1.Fighters   3 squadrons of 9 planes = 27

2.Bombers   4 squadrons of 9 planes = 36

Total on carrier   =   63

Number on MAC

1.Fighters   1 squadron of 9 planes =   9

2.Bombers   1 squadron of 9 planes = 9

Total on MAC   = 18

a) LAND-BASED AIRCRAFT

Types

1.Fighters

2.Dive-bombers

3.Medium bombers (can carry one torpedo)

4. Heavy Bombers (can be used as VLR anti-submarine aircraft).

Number on airfield

A maximum of three squadrons.

Bombers

1.   *Torpedo*

2.   If target moving 4, 5, 6 a hit

3.   If target stationary 3, 4, 5, 6 a hit

4.   *Bomb*

a) Dive-bombers and ship-bombers carry one load.

b) One load= 1 die roll; result the same as the secondary fire table.

c) Medium bombers carry two loads

d) Heavy Bombers carry one load= main armament fire table.

Armour

Before a bomb can be dropped by dive- and medium-bombers one die is rolled: 1, 2 armour not penetrated; 3, 4, 5, 6armour penetrated.

Fighters

When a fleet, post or airfield is attacked the procedure is as follows:

i) One die is rolled: 5 or 6, surprise gained an the attack is made, fighters and flak attack after the attack by aircraft

ii) If surprise not gained, protecting fighters attack, one die rolled:

iii) 1, 3, 5 fighters attacked

iv) 2, 4, 6 bombers attacked

v) AA opens fire

Combat

1)   *Fighter v. Fighter*: For every six machines on die rolled, Number= number of aircraft destroyed.

2)   *Bomber v. Fighter*: As above, but unless bombers are heavy, fighters suffer half casualties

3)   *Combat between 'left-overs'*

Each plane type has a points value.

  Fighters   3 points

Dive-bombers   1 point

Medium bombers   2 points

Heavy Bombers   3 points

Combat 1 aircraft v. 1 aircraft

Procedure. One die rolled, number multiplied by number of points. Higher number wins.

AA fire

One die for every twelve guns. For extras 5, 6 a hit

Refuelling and rearming

Take ½ map move or 1 table move

Range of aircraft

Fighters, dive-bombers   10 squares range

Medium bombers   20 squares range

Heavy bombers   30 squares range

Speed

Fighters, dive- and medium bombers move 10 squares per map move

Heavy bombers move 9 squares per map move.

Attacking

a) (Installation on shore).　　Same as for bombers above

N.B. 1. If surprise achieved ships must remain stationary for two moves, otherwise one move.

2. If surprise is achieved fighters can arrive over the port after the necessary number of moves have elapsed, otherwise they are' patrolling' above the port.

AA fire – one die for every six AA guns on the ships

b) Airfields

These are attacked 'on the map', one die to see if surprised.

i) Surprise

 One die for six aircraft of attacking force.

One die for twelve aircraft of attacked force One dice to see if airfield destroyed—1, 2, 3, field destroyed, 4, 5, 6 field undamaged

ii) *No Surprise*

One die for every twelve aircraft of attacking force

One die for every six aircraft of attacked force

One die to see if airfield destroyed. 1, 2 field destroyed; 3'4'5, 6 field undamaged.

Carriers

Procedure: Same as for bombers above.

N.B. 1. If surprise, no aircraft can take off until second move, otherwise in the air.　2. If aircraft are in the air and the flight deck is destroyed, they must either land (if in range) or crash.　3. If flight deck destroyed, no aircraft can take off.

   Speed

	Table	Map
Battleship	6	1 square
Battlecruiser	9	1 square
Pocket Battleship	9	1 square
Aircraft Carrier	9	1 square
Cruiser	9	1 square

Destroyer	12	1 square
Frigate	12	1 square
MAC	6	1 square
Merchantman	6	1 square
Submarine (surface)	6	1 square
Submarine (submerged)	3	½ square
Other ships	6	1 square

N.B. Submarines cannot surface and submerge in one move

8: Fletcher Pratt: Naval and Air War Games Genius

For further details on the Fletcher Pratt Wargame, see *Fletcher Pratt's Naval Wargame* by John Curry (2011). This contains much previously unpublished material about this game.

Fletcher Pratt was an American writer and a naval expert; one day in 1929, bored with card games, he and a group of maritime-minded friends invented a naval wargame. They bought some model ships, pushed back the living-room furniture and set to on the floor; by the time they were finished they had devised rules for a mammoth contest that could employ up to sixty people a side, and needed a large gymnasium or ballroom to play in, plus fleets of accurately scaled model ships. Each model ship was commanded by a player, who manoeuvred around the floor under the direction of his admiral, steaming at scaled speeds. A 30 knot ship could move at so many inches a turn, a 20-knot ship two-thirds that distance, and so on. It was possible to shoot at ships by an ingenious range-guessing method, but a referee was required to decide whether or not a hit was scored in accordance with elaborate charts and tables.

The game became so realistic and popular that its players occasionally tried out real naval battles to see if history recorded that the right side had won. Sometimes they would experiment with battles before they happened -one such case occurred when Pratt pitted the German pocket battleship *Graf Spee* against three small British cruisers. The British won, and everybody decided that had been a mistake - then exactly the same thing happened in the real fight at the River Plate, and Pratt realised with awe that he had been right and the experts wrong!

In the book *Naval War Games*, by Donald F. Featherstone, the author has attempted to simplify Pratt's undoubtedly vast and complicated game so that it can qualify for inclusion as a table-top naval game. The rules that follow are similarly adapted to cope with the aircraft aspects of naval wargames fought to this adaptation of Fletcher Pratt's rules. If they appear to be involved or obscure it is because they are designed to be operated in conjunction with the full rules for naval warfare published in the book *Naval War Games*.

a)   Classes of Aircraft. There are four such classes - pursuit, observation, bomber and patrol. Patrol planes are always seaplanes; the others may be either land or seaplanes.

For computing purposes pursuit and observation planes are rated at 750 points each; bombers at 1,250 points; patrol planes at 1,750 points (This rating will only be understood if used in conjunction with Pratt's *Naval Wargame* rules.)

The view from the air. Chikuma (Japanese Heavy Cruiser) under air attack during the Battle of the Santa Cruz Islands, 26 October 1942. Photographed from a USS Enterprise (CV-6) plane.

Land planes may only operate from shore stations or from carriers. A land plane coming down on the water is lost

b)   Ranges and Speeds. In the following table the figures given are purely arbitrary and are given as units specifically to show their ratio one to the other. They will need to be formulated or adjusted to suit the user's game and rules, taking space and time into consideration.

Class	Has fuels for moves	Speed	Deduction form speed for each level climbed
Land Pursuit	25	75	2
Sea Plane Pursuit	20	70	2
L. Observation	56	65	3
S. Observation	50	55	3
L. Bomber (loaded)	60	65	4
L. Bomber (unloaded)	60	67	3
S. Bomber (loaded)	56	55	4
S. Bomber (unloaded)	56	57	3
Patrol	89	54	4

Aircraft launched from catapults are already at level 3.

c)   *Refuelling.* Refuelling an airplane takes two moves.

d)   Any ship having the necessary cranes or masts may pick up a plane, but the ship must not be moving faster than 15 knots and must continue at the same speed for one move after picking up the plane.

e)   If the ship's catapults have been damaged it cannot shoot off the plane again.

Section One. Aircraft against Ships

a)   Airplanes may be loaded with bombs, the number and type of which must be written down before the plane takes off.

b)   Patrol and Bomber planes carry 2,000 pounds of bombs or one torpedo. Observation planes carry 500 pounds; pursuit planes carry 200 pounds. These weights may be made up of any type of bomb listed below (see note g).

c)   *Bombing.* When a player handling an aircraft wishes to bomb he does not move the rod carrying his plane. Instead, and *during* the move period, he lays and pins an arrow at the foot of his rod, writing on it the number of bombs he wishes to drop. If he is using the Pratt estimated-range method of deciding whether a hit is registered, then he will also write on his arrow the estimated range to the target. Otherwise he will, when the time comes, decide whether a hit has been scored by means of a die or some similar chosen method.

If the estimated-range method is being used it will be the diagonal distance from the actual position of the airplane on the rod to the target.

d)   Bringing the plane well down the rod to simulate a dive-bombing attack is permissible and is not considered a move.

e)   Bombs may be dropped at any distance up to the limit of an airplane's move, but not beyond that distance.

[Note on procedure: during the phase when ranges are measured (if the estimated-range method is being used) the diagonal distance from the airplane towards its target is measured and then bomb hits are determined in the same way as one determines hits or misses when ships fire at each other (see *Naval Wargame* rules)]. After this has been done, and before the effects of AA fire are computed, the airplane rod is moved to the spot where the bombs fall. That is, when an airplane is bombing, the commander of the ship firing its AA guns at the aircraft is required to estimate where the plane will be after its rod has been moved. But this player has advance notice of the bombing attack, since the bomber is required to lay his arrow during the moving phase, before the ships lay their firing arrows.

f)   This bombing rule does not affect torpedo planes. Torpedoes are laid from planes in the same way as they are laid from ships (see *Naval Wargame* rules). But to launch a torpedo the airplane must come down to a point not over two levels from the surface on the move before the torpedo is released.

Damage done by airplane bombs:

Bomb	Damage by direct hit	Damage by indirect hit – within less than 1 inch of the ship
25 lb	100 points	50 points
100 lb	400 points	400 points
250 lb	1,200 points	1,500 points
500 lb	2,500 points	3,100 points
1,000 lb	5,200 points	Same as for a torpedo

Section Two. Airplanes against Submarines

a)   Airplanes sight submerged submarines when passing within 2 inches of the submerged submarine's location. The owner of the submarine then notifies the airplane commander of the position of his submarine.

b)   Airplanes lay arrows, etc., to bomb submarines exactly as when bombing surface ships.

Section Three. Ships against Airplanes

a)   Ships fire against airplanes exactly as against other ships, but lay a red firing arrow instead of usual one

b)   When using estimated-range method the firing arrow must be marked for elevation as well as range - example: '24 in—16 in. Up'

c)   Any gun may be fired at airplanes flying at level 4 or less.

d)   In firing at airplanes, AA guns of less than 3-inch calibre are assumed to fire twice, the shots falling each 1 inch nearer the firing ships, as the other gunnery (see Naval Rules).

e)   A direct hit by any gun destroys any airplane.

f)   If there is no direct hit, but a shell comes within 1 inch of a plane the following table is operative:

(Explanation of symbols: Des. = plane destroyed. B.D. = plane brought down and must be repaired. N.E. = no effect.

Gun	Pursuit	Observation	bomber	Patrol
37 mm	Des.	B.D.	N.E.	N.E.
40 mm	Des.	B.D.	B.D.	N.E.
47 mm	Des.	Des.	B.D.	N.E.
3 inch	Des.	Des.	Des.	B.D.
3.5 inch – 3.9 inch	Des.	Des.	Des.	B.D.
4 inch – 4.1 inch	Des.	Des.	Des.	B.D.

Above 4.1 inch	Des.	Des.	Des.	Des.

g)   Planes brought down must be repaired, taking the same time and under the same terms as for refuelling.

Section Four. Aircraft against Aircraft

a)   Airplanes fire against airplanes as ships against ships; that is, by laying arrows and estimating ranges or by whatever similar method user desires. Airplanes cannot fire at any range exceeding the length of their moves.

b)   Their firing follows the same rules as to bombing in regard to moving. That is, the arrow is laid during the manoeuvring phase of the move.

c)   Airplanes may not both fire on planes and bomb ships on the same move.

[Note on procedure: In scoring, airplane's attacks on airplanes must be worked out before airplane's attack on ships. Thus, A may lay an arrow to bomb a ship, but B, whose ship is being bombed, also has airplanes up, and his planes lay arrows to attack A's bombers. If B is accurate in his range estimate (or his dice fall well!) and he shoots down A's bomber, the bomber's attack on the ship is not counted.]

d)   *When airplanes fight each other*. If both have estimated the range correctly (if using that method) the damage inflicted by the plane flying at the higher level takes precedence over that inflicted by the plane at the lower level; that is, the lower plane is destroyed, the higher plane is undamaged.

e)   Damage inflicted by pursuit planes takes precedence over that inflicted by other types, regardless of level.

f)   Observation planes take precedence over bomber or patrol, regardless of level.

g)   But patrol planes are assumed to be armed with 37mm cannon, which can inflict damage without direct hits.

h)   *Formation Flying*. Regardless of other procedures, damage inflicted by planes flying in formation takes precedence over that inflicted by individual planes. If both sides are in formation these precedences can cancel each other out if required, or 'order of firing' dice throws take over. Two planes do not constitute a formation; three planes do.

9: Air War Gaming Based on Fletcher Pratt Principles

This chapter has probably the earliest attempt at a method for quantifying military aircraft in terms of their combat values. Such operational analysis was the very foundation of Colonel Dupuy's[36] *Quantification Judgment Model* and the various military computer simulations such as *Theatrespiel*[37] and *Janus*[38]. All of these used very similar formula to put a combat value on military aircraft.

From the evidence of this book, first published in 1966, it looks like Donald Featherstone, like so many innovations in wargaming, was there first. It also suggests that there were more links between military and hobby wargaming than are first apparent.

Given in the previous chapter is an adaptation of Fletcher Pratt's rules for combining aircraft and ships in wargames. Here an attempt is made to convert for use with aircraft the principles of Pratt's assessment of the fighting powers of ships. Emphasis must be laid upon the fact that this is merely the beginning. It may very well be that there exist far more suitable and accurate methods of assessing the formulae for aircraft potential. Accepting that there is a workable and not-too-complicated system outlined here, it will at once be seen that this method of 'whittling away' the power (speed and offensive ability) of an aircraft has a realistic basis. Not all aircraft in wartime were involved in a 'sudden-death' system so that they either shot down their opponent or were shot down themselves - a no-alternative method brought about by the dice decision of wargaming. Many aircraft limped home on a 'wing and a prayer' with only one engine and half the crew dead. The system described herewith makes reproduction of this reality possible on the wargames table:

For the aerial adaptation, players require the following:

1. Model aircraft

2. An 'aircraft card', giving the characteristics of the aircraft represented by the model.

3. A steel rule—to measure the distance the aircraft can move and to be used to indicate turns, banks, etc.

The Aircraft Card

On each aircraft card appears not only a summary of its military characteristics (speed, guns, etc) but also a scale of figures. The last, highest figure on the list represents the total value of the aircraft in points, as calculated by a formula. Each time the aircraft is hit by an enemy projectile the total value of the aircraft decreases by an amount proportioned to the power of that projectile. As this value falls off, the aircraft's speed decreases and its armament goes out of action. It is necessary to consider the following factors when making out an aircraft card:

1) Armament

2)   a) How many guns?

3)   b) Their calibre

4)   c) Do they—fire forward?   rearwards? Are they traversable?

5)   Speed

6)   Altitude

7)   Bombs, Torpedoes

8)   Armour

1.   Armament

Allow 1 point per every 10 mm

Thus, two 20mm cannon would be 4 points and two 7.92 machine guns would be approximately 1.5 points

Add 2 points to total if guns are traversable or fire rearwards.

2.   Speed

Just note it for the present.

3.   Altitude

Allow 2 points for every 5,000 feet of known maximum altitude ability.

4.   Bombs, etc

Allow 1 point for every 250 pounds carried.

5.   Armour

Add 2 points if the aircraft has any protective armour.

As an example, let us take a German World War II Me109 fighter:

Armament –

One 20 mm cannon

Two 7.92 machine guns

Giving a points total of 3.5

Altitude – 20,000 feet

    Points = 8

It has armour for pilot protection

    Points = 2

This gives a total of 13.5 points.

Now multiply that figure by the speed of the Me109 – 380 mph.

Thus, 13.5 x

380

——

5,139 – the formula value for an Me109.

This formula can be criticised in number of ways – it brings into mathematical relation widely different elements among which there is no genuine mathematical relation. It is extremely arbitrary; but the criterion is – does it work out in practice? and experiments indicate that it does.

To give further examples permitting some basis of comparison we can produce the following table:

Aircraft	Formula Points Value
Mosquito	11,600
Spitfire	8,610
SE5 (World War 1)	1,055
French Nieuport (World War 1)	679

These figures were obtained as follows:

Mosquito

Armament	4 x 20 mm cannon
4 x .303 machine guns	
Points = 11	
Altitude	36,000 feet
Points 14	
Bombs	2 x 500 pounds
Points = 4	
Total 29 points x Speed; 400 mph = 11,600 Formula Points Value.	

Spitfire

Armament	4 x 20 mm cannon
4 x .303 machine guns	
Points = 11	
Armour plate	= 2 points

Altitude	20,000 feet
Points 8	
Total = 21 points x Speed = 410 mph — 8,610 Formula Points Value	

A Supermarine Spitfire Mk IIA. The last one from the Battle of Britain (1940) still flying.

S.E. 5A

Armament	One Vickers machine gun
One Lewis machine gun	
= say 1.1 points	
Altitude	15,000 feet
Points 6	
Total = 7.5 points x Speed = 137 mph — 1,055 Formula Points Value.	

Nieuport

Armament	One machine gun
Four incendiary rockets	
Points = say 1	
Altitude	15,000 feet
Points 6	

Total = 7 points x
    Speed = 97 mph
 	
    —
 	
    679
Formula Points Value.	

Of course, all these can be shot full of holes, but if they serve as an indication, or even an inspiration, to better-informed aircraft 'bugs' then they have served their purpose.

Having obtained the aircraft's total value, we are now ready to work out the aircraft card for it. Let us take the Spitfire as an example. Speed in an undamaged condition is 410mph. Thus, we may assume that every time it loses one-fortieth of its total value it loses 1mph speed.

OR

Every time it loses 20 points of its total value it loses 1mph. It would not work out that way in practice, where a single hit might reduce its speed by 100 miles per hour and another dozen by nothing, but we must make approximations somewhere or never reach a result.

Taking the Spitfire as an example, we have the following chart:

Damages in Points	Speed
1,000 points	360 mph
2,000 points	310 mph
3,000 points	260 mph
4,000 points	210 mph
5,000 points	160 mph

Assuming, for convenience, that three .303 machine guns equal one 20mm cannon - the Spitfire has four cannon or the equivalent of twelve machine guns, plus four .303 machine guns. This gives a total of sixteen 'guns' of two types. Thus, every time the Spitfire loses 500 points she loses a machine gun and every 1,500 points loses a cannon. Combined in a single list, this gives us the following aircraft card for the Spitfire:

Points	Points
500 – 385 mph	3,000 – 260 mph

one machine gun out	four machine gun out } out two cannon } out
1,000 – 360 mph two machine gun out	3,500 – 235 mph 4,000 – 210 mph 4,500 – 185 mph three cannon out
1,500 – 335 mph one cannon out	5,000 – 160 mph 5,500 – 135 mph 6,000 – 110 mph four cannon out
2,000 – 310 mph three machine gun out } out one cannon } out	6,010 – Shot down
2,500 – 285 mph four machine gun out } out one cannon } out	

A similar aircraft card made out for World War I fighter SE5A gives us the following:

SE5A   Total Value 517

Speed 137 mph

So, every time it loses 1/137 of its total value it loses 1 mph.

OR

Every time it loses 3 ¾ points it loses 1 mph.

Damage	Speed
60 points	121
120 points	105
180 points	89
240 points	64
300 points	48

Armament

One Vickers machine gun = two guns – so every time it loses 172 points

One Lewis machine gun = it loses a gun

(1 Vickers = 2 Lewis guns)

So,

60 points	121 mph

120 points	105 mph
180 points	89 mph Lewis gun out
240 points	64 mph
300 points	48 mph Vickers gun out
310 points	Shot down

Before going any further it is necessary to work out a method of obtaining hits on aircraft so that the respective points values can be deducted when applicable. Let us assume that a hit from a .303 or a 7.92 mm machine gun scores 250 points; that a hit from a 20 mm cannon scores 500 points and a hit from a 37 mm cannon scores 750 points. (Hits from higher-calibre guns and for AA guns can be similarly worked out on the same proportionate basis)

Cut from thin talc or stout transparent plastic a number of 'arrow-shapes'. Paint the tips of some black for machine-gun fire and others red for cannon fire. During the shooting phase of the game-move lay these arrows on the table immediately below the aircraft that is firing: put them in position so that they are pointing at their target. The player then writes on the arrow his estimate of the distance (in inches) from the firing aircraft to the target. (If plastic or talc is used, these figures can be written with a chinagraph[39] pencil and rubbed out at the end of the move.) It must be decided if targets are considered in their final positions *after* moving or whether they are attached during that phase of the move when they cross the line of fire.

It is assumed that when an aircraft fires *all* its guns the first hit will be exactly at the point indicated in writing on the firing-arrow. Thus, if 36 inches is written down, the first bullet/shell will 'fall' 36 inches from the nose of the firing aircraft. The other bullets/shells of the firing aircraft will each fall 1 inch to the side of the first projectile's 'falling-point' and in the general direction that the firing aircraft is moving. If the two aircraft are moving in the same line the successive projectiles will fall 1 inch 'up the target' or behind it, depending upon whether the attacker is a faster or slower mover than the target aircraft.

Players must also decide whether or not they reveal hits to each other.

We are now ready to go into action with our Spitfire - using its aircraft card. Suppose in the first blaze of fire it receives a hit from a machine gun which does 250 points damage. This is less than the lowest figure on the card. Accordingly, there is no change in the Spitfire's characteristics, but the fact that it has sustained 250 points damage is noted on the card.

Now, at the second exchange of shots suppose it is hit by a 20mm cannon-shell, which inflicts 500 points damage. Plus 250 points damage previously received making a total of 750 points. This falls between the first and second set of figures on the card and indicates that its speed is now cut down to 385 mph and it has one machine gun out of action.

Damage is always cumulative; if the Spitfire is hit by another machine-gun bullet in the

next exchange it sends the damage up to 1,000 points and it is down to 360 mph and has two machine guns out. And so we go on until one or other of the aircraft is shot down or the action is broken off.

Speed Scales and Moving

The steel rule is used for this purpose; its equidistant markings do not represent so much the actual distance of an aircraft in the sky as a means of assessing comparative speed.

The length of the moves - and the firing ranges - has to be regulated by the size of the playing surface.

The flexibility of the steel rule enables measurements to be carried out when an aircraft turns or banks; such manoeuvres will, of course, conform to the capabilities of the aircraft concerned.

The actual game is carried on to a definite pattern or cycle, beginning with time being allowed for the players to consider their moves. Then players move their aircraft - this can be done within a specified time limit, if desired.

Then guns are fired, players laying their firing-arrows and writing ranges - again, this may be timed. Then the fall of the projectiles is measured; damage is totalled and entered on the aircraft cards. Then the same cycle is repeated.

10: Air War Games by the Experts

Here are three air games devised by well-known war-gamers. They are included because they are ingenious and because they stimulate the imagination!

DOG-FIGHT: *A game for two aeroplanes* by Roger Moores.

1. Use two planes (Airfix kits make up very well), perhaps a Messerschmitt and a Spitfire. A plane is mounted on a ball joint which is in turn attached to a length of telescopic rod (such as a car wireless aerial). If possible the telescopic rod should have at least six sections, each section representing 2,000 feet. This is stuck in a strong wooden base. The plane can thus be raised and lowered, and can tip up and down and from side to side.

2. Moves and turning radii. Move - 12 inches, turning radius 18 inches. A plane may climb 2,000 feet (i.e. one section of the rod) or dive 12,000 feet (i.e. the whole rod) in one move. You *must* move at least 6 inches.

3. Ranges. Planes may only fire forwards, and target must be directly in front of the attacking plane. Range 18 inches.

4. Firing (adaptation of Lionel Tarr's 'strike and defence' rules. See elsewhere in this book)   Throw three dice - if you equal or better the enemy's defence value, then a hit is scored.

Defence values

Front or rear of plane 12

Sides 11

Belly or top 8

Five hits on a plane shoot it down

5. A bit of 'carpentry' is required to set the two planes up and the rules are elementary, but there are possibilities here, surely? Bombers, dive-bombers, transports, carrier-borne planes, etc., could all be used in conjunction with land warfare to good effect.

Two air games have been devised by American wargamer Joe Morschauser (author of *War Games in Miniature* –1962[40]). Joe writes:

Dogfight- a 1/144 Bf-110 (Academy) pursues an Amiot 354 (conversion)

Since I lack opponents mostly I have spent a lot of evenings in front of the TV assembling various kits (which I do poorly) of World War I aircraft. Then during a week of vacation I managed to get hold of some opponents and run off a purely air-combat game. This worked out first rate and in some ways is more fun than land games.

The air wargame involved quarter-scale aircraft (bigger scale than Airfix) and a bombing run, plus dog-fights. What I did was to set up a game in which three Gotha bombers had to run across the table, then come back some turns later. Meanwhile fighters attempted to not only shoot them down during table runs but, of course, engaged in air battles themselves. I use a point system (like Roster system) for each aircraft so they don't get knocked out right off the grids on the table. Actually it was pretty good to look at, especially while the bombers made their run through the fighter-interceptor screen of the Allies. When you get it down to things like the effects of gunners' fire and manoeuvre, air games are a hell of a lot of fun. Thing is to keep a lot of detail in the games, else they get too simplified and go too fast.

The bombers rolled for hits which counted as total points towards score of German side (bomb hits, off table). Point total to start was about even, though, of course, Germans were out-weighed in fighters, having to take bombers into account. Side having most points *remaining* won, in this case the Allies, for though the Germans got through, made their bomb runs, they lost two bombers returning and did not do well with their bombs on bombing rolls. If they had done more damage to Allied planes they might have won the day, but the Allies did better, winning the day.

Then we did an air-race game that was something entirely different from the wargame approach. This was run with three planes around a course marked off by checkered-painted pylon towers. It was meant to be a copy of the old Thompson Trophy races held in the States in the late 1920's and the early 1930's. In fact I actually used huge scale (don't ask me what the scale is) planes, three of them, of Thompson Trophy planes: the old Gee Bee Racer, the Springfield Bulldog and a Laird Racer. This set-up looked beautiful, for I laid out a bit of green paper in centre of table, put in some stands and a few miniature

figures, etc. The Thompson was flown at about 100 feet off the ground around pylon towers; very dangerous flying if only at the now slow speed of about 250 mph. Planes were colourful as are the models I put together and painted. I have a set of rules which involve some crazy manoeuvring on the table and at one point a Gee Bee and a Bulldog managed to box in the Laird so he couldn't pass for a whole lap. Nice to say, I finally won the race, beating Hank in a final dash. Each of three planes has a different speed but each is also different in manoeuvrability which can compensate if used. I'm planning to enlarge this racing operation to include a smaller-scale set of planes, but more (six, I hope), which should make for wild races all the way.

A.W. Saunders of Taunton, England, is a veteran wargamer of many interests. Amongst them are the air game given below:

Counters made with plan shape of various types of aircraft. Symbols placed on table denoting various targets, cities, etc. Other symbols were flak groups and airfields; the fighter squadron counters placed behind airfields. Each counter was a section of three aircraft, when taking off counter placed on airfield thus taking up one move. Flak symbols placed so as to cover likely targets, but not enough to adequately cover all targets.

Bombers allowed one throw per counter when over target; target given number of points according to its value and possible difficulty of hitting same. This point total was gradually whittled down effectively or otherwise by attacking bombers

Bombers came in from edge of table with fighter escort.

Farthest target considered too far for fighter escort but nearer targets could be covered by fighters.

Moves of fighters faster than moves of bombers, but no aircraft counter could be moved at more than right angles.

Casualties caused by dice, six means enemy destroyed.

Model aircraft can be used instead of counters.

Living-room visualised as air space with symbols representing targets, flak groups, radar stations and airfields. I have roughly drafted rules and business hinges on ranges.

Each aircraft or possibly section of aircraft will have its flight checked as regards moves, that is range.

Use a board like a cribbage board and peg moves, each peg coloured as will be a stripe on aircraft.

Radar symbols will cover a given corridor and if they can be knocked out the bombers will be allowed a certain number of moves before actually being placed on the floor. Thus the enemy will be unaware of size and direction of effort made by bombers. Then again, small harassing attacks can be made on airfields or secondary targets, thus decoying some of enemy's fighter strength into the air, thus lessening the odds against the main bomber stream.

Fighter squadrons will be grounded for a certain number of moves to refuel and rearm. Again they will require some moves after take-off to enable them to gain sufficient height in which to engage bombers. Long-range fighters will escort bombers to and from target, and any aircraft failing to reach home base will be considered lost.

Two types of escort fighters - Mustang and Thunderbolt. Spitfires with shorter range will be available for targets nearer home and to meet returning bombers. Medium bombers and fighter-bombers will be used to attack airfields and radar stations. The defence will consist of radar, flak and fighters. The latter will be FockeWulf 190's, Me109's and Me110's.

Aircraft can be made on small stands only a few inches above the floor, the fighting will then take place on the same level. Idea of long wire passing through a hole in aircraft which could then be raised and lowered as case may be. Give them height then one has the problem of what advantage to give lucky aircraft.

Back in 1958, British war-gamers were intrigued to hear of a large-scale war game that was taking place in California, USA - a game with a difference because it was between model aircraft of 1914-18 vintage! The first information came from Frank Conley, who apparently commanded the German forces. Frank freely acknowledged that the pioneer of this novel type of wargaming was A. W. (Ed) Saunders of Taunton in England, who initially aroused their interest with his fascinating accounts of air battles. The commander of the French and British air forces was Jack Scruby and their games were reported to be "darned interesting, very fast and quite realistic." They played outdoors (in Conley's backyard) so as to get sufficient space and "it looked really great to see swarms of planes moving around on their 'altitude' dowels."

In a periodical dealing with wargaming, Frank Conley wrote:

Air wargames have been going at fever-pitch here in Visalia, California. So far we have developed into quite a group - almost a dozen people - and our outdoor games are drawing much attention. In fact, we have a waiting list of interested would-be players who want to get into the 'fight'. Battles are occurring regularly on Friday nights at my house, and are well-attended by wives and sons of the participating players. Thus it's becoming quite an event here.

At present we are fighting over the France of 1914-18 as copied from actual maps of the battlegrounds. A campaign is being fought involving the actual countryside, and preliminary battles are being fought for control of the air. Some beautiful plastic model planes have been built, and generally the game has at least three players for each side - one each controlling a fighter or bomber squadron, under overall command of one player. We have to date one ace with eleven 'kills' to his credit.

The author is indebted to Jack Scruby for further details of this exciting battling.

Regarding the old air games we used to play here, Frank Conley and I started this way back a long time ago, and for a while it went hot and heavy with a dozen guys playing about once a week, each of them having command of a squadron of aircraft they had put

together and painted themselves. We tried all kinds of air fighting, strafing runs against troops, balloon fighting, bombing runs and just plain dog-fights.

At that time we were using the HO gauge World War I planes mounted on a wooden dowel sticking up about 3 feet from the ground. These dowels were made so one slipped inside another, so that we could get 'altitude'. At the top of this 'altitude stick' was a little ball-and-socket device, with a pin in it to which the airplane was attached. This gave the airplane 'manoeuvrability'—i.e. you could point the nose down, up, or bank the plane to make it look realistic, as it was diving or climbing, banking, etc.

A large wooden block held the dowel to the ground (and, of course, kept the airplane from tipping over). On this dowel was painted an arrow, and this was the 'direction pointer' in which MG fire (from single-seater fighters) was determined. In other words, you were allowed a 15 degree arc to either side of the arrow, but no more, when firing the MGs. This 'cone of fire', of course, sometimes was bad, for you could be out-manoeuvred.

Fire power from the planes was determined by dice-rolling- one shot per plane per game-move. If you made a 'hit' it was marked down on a sheet of paper mounted on the wooden block—it took so many hits to knock out a plane, depending on what type of plane it was.

We also used a 'turn indicator' to determine how acute an angle a plane could bank in. This, of course, was determined by the actual ability of the airplane itself, according to what it could do during World War I. As I remember it, the SPADs were highly manoeuvrable and could make a turn inside a Fokker, which meant you could get in fire at in turns.

At least, all the fellows knew all about the airplanes, their manoeuvrability, etc., and all manoeuvres were based on what the airplanes could actually do.

The strongest planes were the two-seater observation planes, although they, of course, were slower, and could not dive nor climb as fast as the fighters (which incidentally was also taken care of, depending on the type of fighter plane it was). However, the rear-gunner had that old moveable MG mounted to the rear, and the fighters suffered awful losses attacking them as I remember. The fighter could only fire forward; the observers could fire forwards, to the sides and the rear. And when the big Gotha bombers came into action these were a terror to attack, as they seemed to spit fire from everywhere at once!

We even went so far as to have 'aces'. These were men who had survived the wargame, and had shot someone down, etc. The more planes they shot down, the tougher they were to knock out, and I remember once Frank (who was always the German) had an ace with about ten or fifteen kills that no one could kill. And practically every time this guy made a pass at a plane it flamed! Thus, we took not only the airplane into consideration, but also the pilot. I remember that darn few 'rookie' pilots ever survived a wargame, especially after the aces began to build up. Eventually it became a war of aces, where you had to match your best man against the opponent's best man—otherwise the aces single-handedly shot down everything they brought within MG range.

We definitely used 'tactics' during these games also, attempting to lure the defender away from the 'target' (for example, a strafing run on an airdrome) by sending out a flight of planes well ahead of the main force who were to make the main attack. We played in a backyard that was perhaps 40 feet square, and we used up the whole area as a general rule in this 'tactical' manoeuvring. I remember once my objective was to make a bombing run on a troop concentration (on the ground). I kept my bombers at the airdrome, while I sent out three or four flights of fighters and observation planes to lure Frank away from the 'drome'. Then, at the right minute, my bombers took off, and sneaked through to make the bomb run, before he could bring anything back to protect it. Of course, getting the bombers back home was hell, as his fighters caught them halfway home!

Hope this gives you an idea of these air games. We never did develop the rules too much, using an alternate-move-type game, then each side firing simultaneously (by dice-rolling) if something was available to shoot at. The main thing was that we followed the operational points of each type of aircraft that we used, and actually (as I suppose it really happened in World War I). The best manoeuvring plane was the winner in any dog-fight.

A method of 'dog-fighting' (World War I style) has been devised by Alan Colquhoun of Lagos.

Stage I uses a map on which the front lines, aerodromes, and centres of communication are plotted. Usually one side is attacking (has a reinforced air force), but sides may fight on more or else equal numbers. Object is to establish air superiority by maintaining artillery-spotting patrols over the front line, destroying enemy's spotting aircraft and destroying centres of communication. To achieve this, of course, one side has to destroy the other's scouts.

Pins represent aircraft or formations. Moves are squared off, and aircraft can stay up for so many turns, depending on type. So long to refuel, so long to repair, etc., and so much to gain altitude as opposed to distance.

Stage 2 is reached when aircraft make contact, when models can be used and placed on a plastic cake stand affair (shelves will do, if need be). Described in the chapter dealing with methods of using models.

Fighting rules are then similar to my World War II game, with attacker specifying target and throwing dice to destroy, damage or miss (A premium can be added if seen - direction is worked in from map). Attacked and attackers can then dog-fight, and are presumed to go into a circle at same level; those not so engaged may dive (two levels per turn) to escape, or climb, one level per turn. An aircraft (attacked throws first) may break from circle by throwing a 1 or 2 (he climbs), a 3 or 4 (he rolls off the top) or loops 5 or 6. If attacker then throws a 1 or 2 he climbs and status quo maintained, no result; a 3 or 4 he is shot down as it is presumed aircraft of attacked has gained more altitude and can turn on him (as in diagram A).

If he throws a 5 or 6 he destroys attacker by zooming up underneath him, then having completed climb and looking for opponent (as in diagram B).
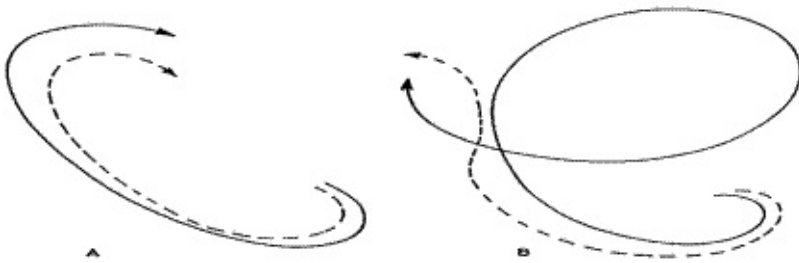
		1 or 2	3 or 4	5 or 6
i.e. pay off to attacker	1 or 2	No result	wins	looses
	3 or 4	looses	No result	wins
	5 or 6	wins	looses	No result

The dog-fight can, of course, be regarded as going on the same plane, in which case 1 or 2 breaks circle, 3 or 4 stall turn, or 5 or 6 keeps to circle. Bombing is by number of hits to destroy target (e.g. marshalling yard), determined by dice and altitude, reducing chance of a hit. Likewise altitude reduces destruction risk by 'archie[41]'.

11: Helicopters in War Games

A most marked advance in modern warfare is the use of the helicopter to convey rapidly men and material to and from the battlefield. It would appear that the role of the helicopter in wargames must tie in with land war games on the table-top. A campaign being conducted with maps holds great fascination when it is considered just how much scope lies therein for para-drops behind the enemy lines; the rapid reinforcement of ground troops or the mounting of a raid with helicopter-bound troops.
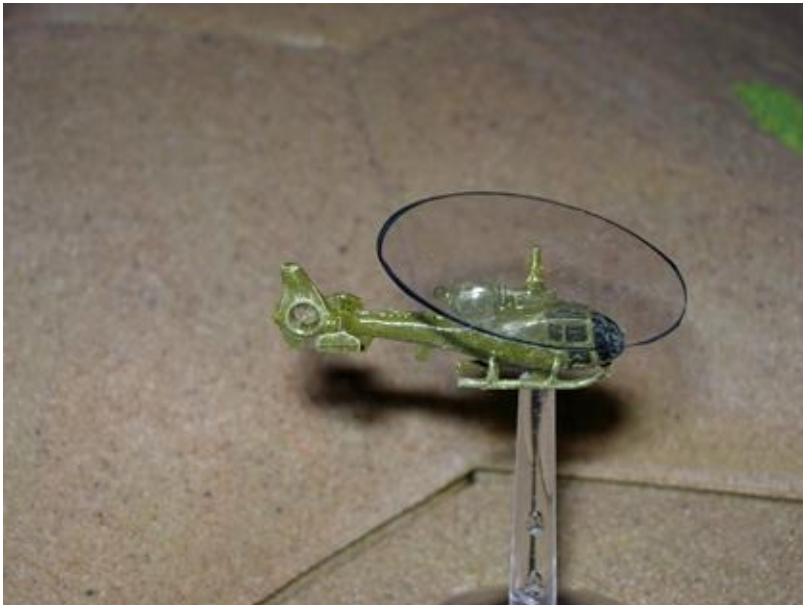
A 1/300 scale Gazelle made by Heroics and Ros moving across hexagon terrain. Photo by Tim Gow and is reproduced with permission.

Of all the aircraft that can be used for wargames, the helicopter is probably the easiest to handle in model form. It travels at a relatively low speed and in a fairly constant path; its salient feature lies in its ability to ascend and descend vertically on to the table-top battlefield. This means that for practical purposes the model can be worked very satisfactorily by means of raising and lowering a nylon thread stretched over the battlefield. Each end of this horizontal thread can have variable attachments so that the path of the aircraft can be altered at will.

It will be necessary for the wargamer to work out rates of movement-both on maps and the actual table - for the helicopter in both horizontal and vertical movement. These will need to be realistically scaled to the movement rates of other aircraft and to vehicles moving on the ground. It will also be necessary to assess the period of wargame 'time' that is required for troops and material to 'embuss' and 'debuss' from a helicopter - this will no doubt take the form of a complete (or part of a) game-move.

A flight of British Lynx helicopters (1/285 or 6mm) is flying over a squadron of Challenger tanks. Photo by Tim Gow.

It could be so arranged for the troops and material carried in a helicopter to be represented by coloured (or otherwise) marked counters, as is done in Ron Miles's rules for the use of paratroops. The men and equipment marching or being conveyed to the helicopter in the actual form and then being replaced by the counters which are carried in, or attached to, the helicopter. When they 'debuss', the counters are removed and in their place are substituted the actual numbers of men and equipment they represent.

12: A Strategical/Tactical Air War Game without Models

In the book *Naval War Games,* by Donald F. Featherstone, there is a chapter describing at some length the naval wargame of Charles Dick of Edinburgh. There is much in this game which can be readily adapted to wargames involving aircraft because it permits the use of space and concealment, the two most difficult factors to reproduce in air wargames.

Mr Dick uses rolls of wallpaper lining-paper which unreel to allow large scaled courses and movements to be drawn; he uses the scale of 2 cm to the mile for his naval game, but this may well have to be varied for air games. Not only does this method provide a retainable and accurate record of your battle but it is also cheap in that you do not need models, and it is space-saving.

First, draw in coastlines, land features, etc. Then determine wind direction, cloud formation and all those real-life factors which have any bearing on air operations. The aircraft will move paper distances scaled to their speed and their courses will be marked in on the paper. It will be necessary to determine a basic time-move; 6 minutes is a good one, as this makes calculating easy, being one-tenth of an hour - thus, aircraft are moved one-tenth of their mph. When aircraft are not actually engaged they can be moved at the rate of 12 minutes per basic time-move.

It is suggested that strategical maps be drawn—one for each opponent; they can be perhaps 1,000 x 500 miles at the scale of 1 mm per mile. Divide these maps into squares 20 mm x 20 mm (that is 20 miles x 20 miles), and number each square A1, A2 and so on. Each square has its own page in a notebook, and when an aircraft moves it is marked by its owner on the map and pencilled into the appropriate page in the notebooks. When the aircraft moves it is rubbed out and put into another square and another page of the notebook. Movement is not by squares but by the number of miles an aircraft could travel in a given time, so that it is possible for an aircraft to be in the same square two moves consecutively—if it were slow-moving!

As radar will pick up aircraft at about 30 miles distance, a commander can look at all squares within that radius if he is enjoying the facilities of reports from radar stations. Aircraft do not have radar but possess a greater horizon, so it will work out that a commander can look in all adjoining squares (nine notebook pages in all) when he moves into a new square.

The markings in the notebooks are done in each commander's own private code, so that the enemy are not aware of the type of aircraft confronting them. Bear in mind also that radar can see at night, whereas aircraft cannot!

It is necessary to decide at what distance it is possible to sight enemy aircraft, taking into consideration whether the aircraft is viewed head-on or from the side. When aircraft approach each other so that they eventually arrive at points where they are considered to be within sighting distance of each other, the commander of each force has to show the enemy commander a silhouette of the aircraft concerned. This will be a front or side view, as the situation demands. It is now possible for each commander to search quickly through

his recognition charts of enemy aircraft and to note the armament, speed, etc., of the opposition.

When contact is made, firing and the determination of casualties can be worked out by whatever methods the combatants desire.

It can be readily seen from reading Mr Dick's system in *Naval War Games* that this method of conducting air war games lends itself admirably to combined sea/air operations such as Midway. This method permits the vital factors, lacking in most other wargames, of space and distance, to enter into one's calculations.

13: Weather in Air War Games

Weather plays a very important part in all air operations; every World War I book on the subject makes a point of mentioning the effect that weather conditions had on flight operations. It is even possible to read that sometimes the wind held airplanes stationary, even when they were at full throttle. Herein lies an off-beat angle for the World War I wargamer - rules that allow an aircraft to be over the table for three or four moves and not move an inch! So, wind velocity has to be considered in all rules, and fog or dirty weather can ground aircraft of one side whilst the other side could get off the ground without trouble.

When considering weather conditions in relation to air war-gaming there are certain basic factors to be considered. First, the seasons—the war-gamers know, or decide beforehand, the time of the year in which their campaign is taking place, i.e. whether it is winter or summer, etc. Let us assume that air operations will need to be divided into those taking place in daylight and those during the hours of darkness. Thus, the hours of daylight and darkness at specific times of the year must be known. The following divisions are suggested:

	Spring	6.30 a.m. — 7 p.m.
Hours of Daylight	Summer:	6 a.m. — 9 p.m.
	Autumn	6.30 a.m. — 7 p.m.
	Winter:	7 a. m. — 5 p.m

Two Fairey Swordfish aircraft on the snow-covered flight deck of the British Merchant Aircraft Carrier (MAC) ship MV Ancylus

Before an action commences, weather conditions, both local and general, must be decided. This is done by having four sets of cards - one each for winter, spring, summer and autumn - for both local and distant areas. They can be marked as shown in this table:

		Winter	Spring	Summer	Autumn
1	Torrential Rain	Yes	Yes	Yes	Yes

2	Light Rain	Yes	Yes	Yes	Yes
3	Snow	Yes	Yes	No	No
4	Blizzard	Yes	Yes	No	No
5	Fog	Yes	Yes	No	No
6	Mist	Yes	Yes	Yes	Yes
7	Average Day	Yes	Yes	Yes	Yes
8	High Winds	Yes	Yes	Yes	Yes
9	Light Winds	Yes	Yes	Yes	Yes
10	Bright	Yes	Yes	Yes	Yes
11	Sunny	No	Yes	Yes	Yes
12	Dull	Yes	Yes	Yes	Yes
13	Cloudy	Yes	Yes	Yes	Yes
14	Lightning	No	Yes	Yes	Yes
15	Intense Heat	No	No	Yes	Yes

If the campaign is being fought in winter, for example, draw two cards—one local and one general. They might be No. 7 for local and No. 6 for general (over target)—thus the aircraft can set out but will find their mission difficult to accomplish.

Weather conditions and their effect on air operations can readily be assessed, thus:

1)   *Torrential Rain* affects aircraft performance; visibility lessened; airfields become unusable or only permit restricted use.

2)   *Light Rain*-if persistent, might affect airfield ground conditions.

3)   *Snow*—can make flying impossible because of ground conditions; affects visibility; makes targets indistinguishable and difficult to locate.

4)   *Blizzard*-same as for (3) but more so!

5)   *Fog* ditto

6)   *Mist*—much the same effect as (3) but on a possibly diminished scale. Mist will rise and fall at the beginning and end of day.

7)   *Average Day*—reasonable for air operations.

8)   *High Winds*—will affect speed and general performance of aircraft.

9)   *Light Winds*—not much effect.

10) And (11) *Bright and sunny*—perfect for flying—might handicap aircraft flying into sun and attacked by aircraft emerging from sun.

12) *Dull* might affect visibility

13) *Cloudy*—concealment is an advantage to aircraft, particularly if low- flying; can, in latter circumstances, hinder bombing.

14) *Lightning*—holds dangers to aircraft.

15) *Intense Heat*—could cause heat haze with much the same effects as (6)

It is necessary to ascertain the effects of continuity of weather, so at the beginning of every 'campaign day' again pick a card. Throw one die to represent each of the two cards (i.e. the original one and the newly selected card). The card with the lowest die score represents the prevailing weather conditions. This might mean that there is a change in the weather; on the other hand it could mean that it continues without change. This last situation brings complications in some cases; for example, take (1*) Torrential Rain.* On the first day of torrential rain the airfield will begin to get boggy, but probably will not unduly affect aircraft. However, it is possible that one must take into account the movement of those ground vehicles and personnel who are servicing and otherwise keeping the aircraft flying. Thus, for those people, on the first day their ground movement will be reduced by one-third, unless by rail or water. On the second consecutive day of torrential rain their movement is reduced by half; streams will become rivers, and rivers will become impassable, with bridges possibly washed away. Rivers remain in this condition for a day after torrential rain ceases and then revert to normal. On the second day of torrential rain airfields only work at 50 per cent capacity. If torrential rain continues through a third day all land movement will cease; airfields will become unusable.

16) *Light Rain.* No effect from two days of it, but continuation for a further two days has same effect as two days of torrential rain.

17*) Snow.* First half of first day - no effect. Second half - all movement, air operations and visibility, etc., cut by 50 per cent. Second day - all flying ceases; ground movement cut by further 25 per cent. Third day - if snow has ceased and weather is wet or sunny - all movements on land remain quarter-rate and no flying. If snow continues, everything ceases.

18*) Blizzard.* All land/air movement ceases. Aircraft caught aloft in blizzard in danger. No after-effects once weather changes.

19) *Intense Heat.* Any land conditions considered applicable will be reversed by one day of torrential rain or two days of light rain. If, previous to the period of intense heat, there has been torrential rain, the period of intense heat will merely reverse the effect.

14: Battle of Britain Fighter Tactics

I am indebted to the *Sunday Times Magazine* for giving permission to quote from Gavin Lyall's article *Battle of Britain Fighter Tactics* in the issue of 31 May 1966.

FIG 3 Parade-ground Formations handicapped the RAF.   Their basic unit was a tight 'vic' of three fighters (four vics, or 12 aircraft, formed a squadron) where pilots spent their time avoiding collision, none watching behind.
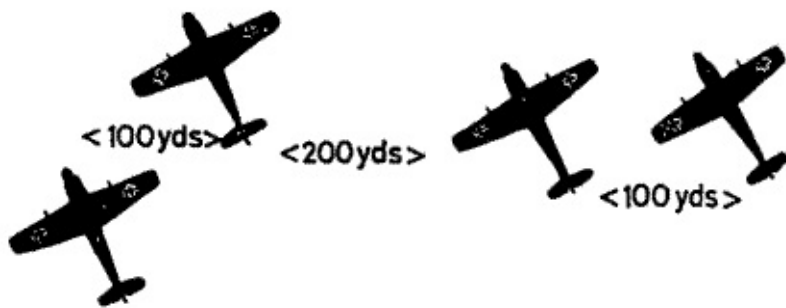
FIG 4. Ideal Fighter Formation, later adopted by the RAF, was the Luftwaffe 'Schwarm' of two 'Rottes' (pairs). 100 yards separated aircraft in a Rotte, with 200 yards between Rottes—and this gave plenty of time to watch behind.

The basic tactics of reasonably evenly matched aircraft had first been discovered in the First World War. Due to Air Council decisions that such tactics were outdated in the days of 'high-speed' monoplanes and that, anyway Germany had no bases close enough to send over fighter-escorted raids, the RAF had to re-learn these tactics the hard way in the summer of 1940.
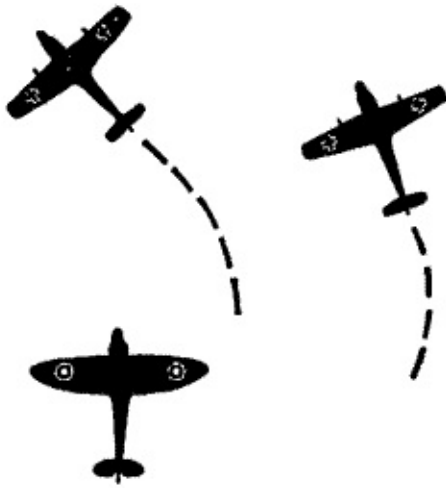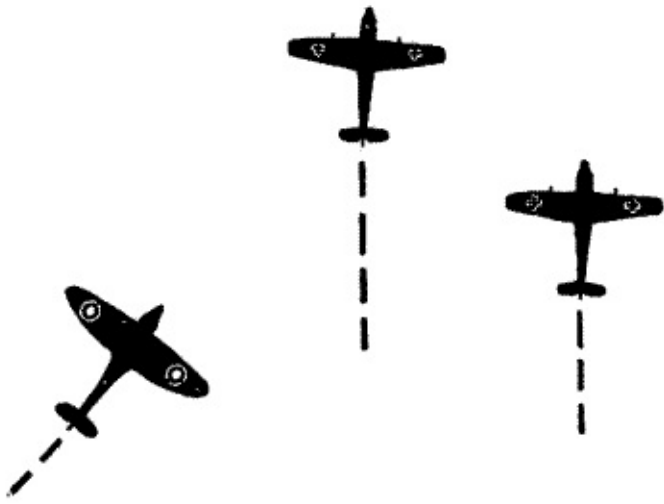
FIGS. 5 and 6.

Heinkel He 111s during the Battle of Britain

The myth that had to be forgotten was the idea that fighter battles were clean,

chivalrous, knightly combats. It was one form of war in which the object was to catch your enemy unaware, from behind, and shoot him in the back. All other tactics stemmed from this. They were:

1)   Go as high as you can. Higher than your opponent, you can refuse battle or accept it at the most favourable moment. And you can cash height into speed by diving, and then, if you miss, re-cash it into height again, leaving him behind.

2)   'Beware the Hun in the sun.' All fighters, no matter what design, have one blind spot: directly into the sun. Attack out of the sun and your enemy may not see you until too late.

3)   When attacked, turn *into* your attacker. If he comes from rear left, turn hard left: it makes him steepen his turn, perhaps more than he can control. If you turn the other way, all he has to do is come out of his turn and you are in his gunsight.

4)   When you are in the circle that inevitably comes from this turn, turn as hard as you can and stay turning. You may come up behind him; the moment you stop turning, he is behind you.

5)   It takes exactly the same time for you to approach and shoot down the aeroplane ahead as it does for the one behind to approach and shoot down you. So keep looking behind - it may make you miss, but it may make him miss you. Ideally, you should never fight alone, without a colleague whose job is to cover your tail so that you can concentrate ahead. So, if alone, go home - as you have all the devils of hell on your tail. You probably have.

6)   This summed up all the other rules - keeping high and up-sun, watching behind, staying in good company - but was the most difficult to keep because it nevertheless contradicted the basic belief that makes a fighter-pilot: I am unbeatable. Yet keeping this rule marked the great fighter leader, the one who led and survived, from the one who was led and who died. It was very simple: If you aren't going to win, don't get into fight.
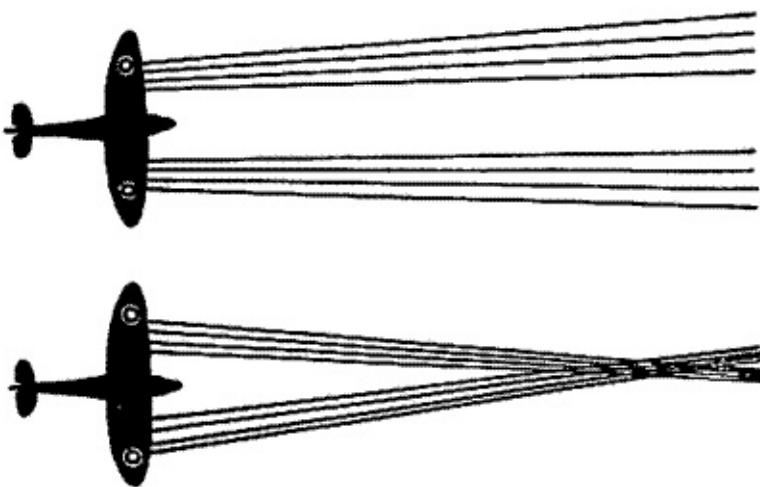
FIG 7. RAF gunnery was poor, so the eight guns of most fighters were adjusted to give a wide but thin spread of fire (top). The crack shots re-adjusted them (bottom) to converge at 250 yards- the average range - and pour 168 machine-gun rounds per second into a space the size of, say, a Messerschmitt cockpit.
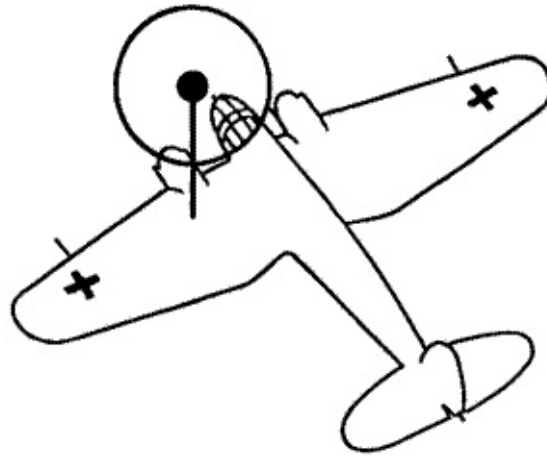
FIG. 8. The secret and problem of air fighting was deflection shooting: you had to aim well ahead of a moving target. The ideal training was on a grouse moor, where the same principles applied. The ideal attack on a bomber was from high and behind, killing the rear gunner first, and then raking it from stern to stem

Until well after the war, when airborne radar and guided missiles became standard day-fighter equipment, no fighter design or formation could do more than stretch the rules. \For example: in the circling fight, both pilots were in trouble. However, a properly handled Spitfire could usually out-turn and catch up on a Messerschmitt - but a Messerschmitt could sometimes dive out of the circle safely because its diving speed was higher.
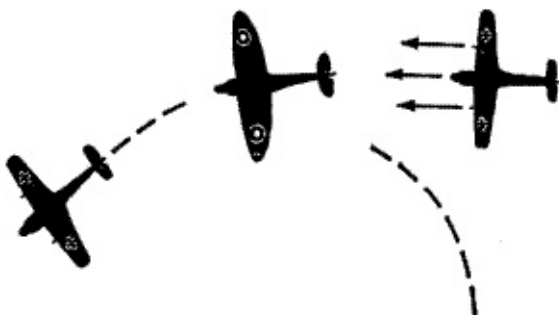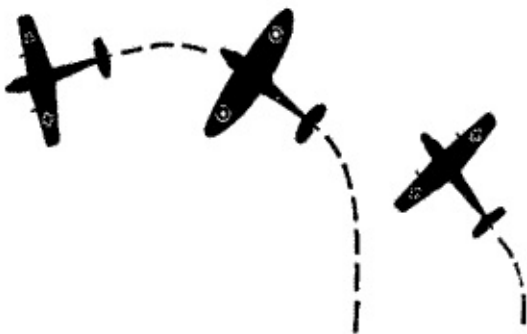
FIGS. 9 and 10 Never fight alone was a maxim the Luftwaffe knew and the RAF learnt the hard way. The 'Rotte' was based on self-defence: No. 2's job was to watch behind, not attack ahead. Here a lone Spitfire attacks the leader, ignoring No. 2—who in real life would be 100 yards off. No. 2 tells the leader which way to turn—and, as the Spitfire

follows, slides in behind its unguarded tail. The leader could have done the same for his No2.

15: Commercial Air War Games

Since writing previous books on land and sea war games there has been a considerable upsurge in the supply of relevant commercial boxed games. This situation is primarily due to the activities of the Avalon Hill Company[42]. From this organisation it is possible to purchase games with self-explanatory titles as *Afrika Korps; Tactics; D-Day; Gettysburg; Waterloo; U-Boat; Stalingrad; Bismarck; Battle of the Bulge*; and of particular interest to naval/air war-gamers is *Midway.*

Since 1958 the Avalon Hill Company has specialised in designing all-skill, realistic games based on actual battles out of the past. To make sure that each game is historically accurate in its design, their research and design staff spends hundreds of hours poring over data found in the Library of Congress, the National Archives, even in public libraries.

Still, from all this research and double checking of events as reported by historians, Avalon Hill games have still lacked that personal touch regarding historical accuracy.

It was then decided that *Midway* should be the game whose design would be authenticated by someone who had actually participated in the battle itself. But who?

By this time they had already completed much of the research, particularly from *Midway, the Battle that Doomed Japan* by Fuchida, *History of United States Naval Operations in World War II* (Vol. 4) by Morison, and *The Big E* by Stafford. Apparently, quite a bit of credit towards the success of the Midway campaign had been attributed to C. Wade McClusky, then Air Group Lieutenant-Commander, abroad the carrier *Enterprise* at the time.

C. Wade McClusky, Rear- Admiral USN (Rtd), was consulted and agreed to help.

As he unfolded his eye-witness account of the actual battle of Midway, the fact that inaccuracies do exist in the history books became increasingly apparent. For instance, one historical account stated that McClusky himself, after returning from bombing several Japanese carriers, took off a second time when in fact McClusky denied taking any part in a second attack, as shoulder wounds received earlier forced him into sick-bay immediately upon his return.

Much valuable and accurate historical data changed hands and Avalon Hill's design staff returned to their drawing boards to construct *Midway* - secure in the feeling that perhaps 100 per cent accuracy would be incorporated into the Battle of Midway game. Admiral McClusky is now on their Board of Technical Advisers.

Midway has been called, amongst other things '…the greatest upset in modern naval warfare' and '…the battle that doomed Japan'. Avalon Hill have endeavoured to re-create the true-life situation as it existed in June 1942 - but now the players take command, guide their task forces in search of the enemy. Once located, the player's tactical ability at naval-air warfare spells either victory or defeat for the USA or Japan. Rear-Admiral McClusky's eye-witness account of the real battle is included with each game, which also contains profiles of each battleship, cruiser and carrier, search-board, battle-board, hit-record sheets

and all accessories.

A bi-monthly magazine, *The General,* is published by the Avalon Hill Company and contains comments, ideas and analyses of the games by players from all over the world. For example, in a recent issue their correspondent on naval affairs writes:

One major exception I would take with the design staff is in the entire concept behind the game. It seems to me that the Japanese commander is given a major advantage in knowing that any American force is at sea at all as in the real battle the entire Japanese operation plan was based on the supposition (fortunately proved to be erroneous) that the American fleet was still at Pearl Harbor. The US fleet gained a complete tactical surprise when it launched its air attacks. Of course, it would be rather difficult to run the game any other way unless perhaps three boards were used representing the entire Pacific area, an unspecified collection of search areas, and a normal tactical board. Unfortunately such a game would no longer be able to go by the name of Midway, but for those who enjoy making their own games it is an idea worth considering.

Another correspondent, Victor Madeja of Brooklyn, New York writes:

There is a major failing in *Midway* that I believe is due to turn pattern: movement, search and operations. Preferably, it should be: ½ movement, search, ½ movement, and operations. Historically speaking, quite a bit of time often elapsed between 'recce' contact and the arrival of the air strike. During the battle the Japanese carriers made a sharp turn northward during this period. Consequently, *Hornet's* air strike became completely worthless; the leading thirty-five dive-bombers and the fighter protection of the TPDs never sighted the carriers and the unprotected torpedo-planes were creamed as a result. This indicates that pre-planned evasive action is not an un-noteworthy factor. This innovation in turn pattern would make it possible for the ship(s) to be nine possible squares rather than one during the operations section. As a moderate compensation the planes are given a strike potential of three adjacent squares, in successive order, out of the nine. Each separate strike would have the choice of striking any one of these three zones providing they are all in range. Of course, to be sure of finding the enemy, three attacks may be sent. At any rate, these strike groups would be closer to what their numbers actually were. It would be foolhardy to launch suicide missions because of the small chance of locating the enemy with sufficient strength. This aimed at changing Midway from the present guessing-match version. Guessing, of course, was a major factor in the actual battle, but in the original version one lucky guess followed by an all-out strike often left the outcome sealed (dividing the ships into groups changes this only slightly).

It must be appreciated that to understand adequately the fullest implications of these notes, and of others that follow, a basic knowledge of the playing principles of Avalon Hill is required. The enthusiastic players and correspondents of *The General* reason out much that is applicable to the subject of this book. For example, Hilary Smith of Baltimore, USA says:

Almost everyone seems interested in the air forces and the navies and their relationship. By using research we figured out the number of planes a country should have. We divided

the planes into two categories, fighters and bombers. In the fighters we include dive-bombers, torpedo-bombers and day and night fighters. The bombers are considered mediums and high level. Aircraft operate in a total of two turns, one attacking; one returning. First turn if one wants to make an air raid he will take his aircraft with or without fighter escorts and send it halfway to the target. During the attacker's turn the defender may intercept the raid with as many fighters as he wants. That battle is rolled but that by no means ends the turn. The defender if any or all of his attacking fighters survive then he must put them aside for they may not be used in the attacker's turn but they may be used in the defender's turn. The attacker's aircraft if they survive the interception may continue to the target. If the attacker wishes he may launch another raid at the same target or at a different target. The attacker can launch as many raids as he has aircraft available. The defender is not obligated to intercept any raids but he can and usually does.

Attacks less than 1-1 not allowed

Defender interceptor aircraft may not soak off at less than a '1-1'. Aircraft fly from air bases where every country which has an air force is given a proportionate number of these bases according to the number of aircraft the country has. The base locations are fixed by the rules in different locations. A country may build more by putting an offensive unit at the same square for two turns. Air bases once constructed and permanent air bases have a strength of six against paratroops dropped on their square and against aircraft attacking it. They have no strength against ground troops. Air bases in cities do not protect the city from air attack if the attacker is only after the city and the attackers do not have to worry about the air base adding to the defence of the city and the air base if the city bombed is not destroyed. If the air base in the city is to be attacked then the attacking aircraft may attack the air base at normal defence for the air base. The usual strength for bombers is two against land targets, ships, etc., and one for defence against fighters. Fighters have a strength of one against land targets and two against bombers and other fighters. Naval fighters operate in the same way as conventional fighters. Flak units add one defensive point to the square it is on. Flak can't attack, merely defend.

Discussing the game *D-Day*, Victor Madeja writes:

'The Allies receive eight bomber counters and the Germans, twelve AA units. The bomber units (they have unlimited movement) can:

1)   Interdict—a) a bomber unit is placed on a river zone (between two squares), any German unit retreating over that zone (moving toward the Rhine) has its combat permanently reduced by one, and armor by two (heavy weapons would be abandoned), the zone for that turn would count as two squares (moving over a river zone to another square would count as three squares); b) the 'B' unit is placed on any plain or city square results in that square counting as two for that turn.

2)   Reduce enemy position—two 'B' units reduce the defensive factor of a defending unit by one (if the unit is doubled four 'B' factors are required) for that turn the unit would be reduced by one (a 443 would, i.e., become a 433) for that turn. Although no unit may be reduced by more than one, up to four units may be reduced each turn. AA units have

unlimited movement, no regular combat factor (like Rommel unit) and no zone of control. One AA unit on a zone or square neutralises the effects of a 'B' unit on that square for that turn. Both these specialised units are moved during the respective players' turns.'

Another commercial game which realistically reproduces much of the complexities of air warfare is *Dog-fight*, a World War I air game, published by the Milton Bradley Company of Springfield, Mass., USA.

The idea of this highly interesting little game is that it covers a section of the Western Front in 1918, behind which are situated two aerodromes on either side, German and American. Each aerodrome houses one squadron or *Jagdstaffel*, which is represented by, for the Americans, three SPAD fighters, and for the Germans three Fokker biplanes.

At the commencement of the game each side flies off a fighter from each squadron by mounting it on a stand. For each plane airborne fire cards are drawn from the squadron pack. These cards are the defence and attack points of the plane; the attack cards are machine-gun fire, rated in numbers, while the defence cards are of two types, a barrel roll, which cancels an attack from the side, and a loop, which cancels a tail attack.

Briefly, each player in turn throws two dice and moves his two planes (one from each squadron) in accordance. If this move brings contact with an enemy plane he attacks it and produces an attack card. If the enemy cannot produce the requisite defence card he is shot down. An aircraft, once airborne, cannot land at its base until it has either been in combat or crossed No-Man's Land.

The object of the game is, of course, to destroy all the opposing planes. A plane which has shot down an opponent and returned successfully to its base gains an advantage on its next flight; attacks can be made on grounded aircraft; anti-aircraft guns play a part. Although, of course, luck in drawing the right combination of attack and defence cards is important, the game calls for a high degree of tactical skill and provides a fascinating half an hour's play. It can also be used as the basis of a larger scale and more varied game if wished.

It might be that the commercial games already mentioned do not fit the reader's requirements. For them it is possible to create their own game based on the Avalon Hill games already in existence. Writing on this theme in *The General* Hilary Smith says:

Building Your Own Game is Laborious—But Fun

I would like to tell you something directed towards those persons who write and ask what the units are, the symbols I use, the strengths of the various units, etc., concerning my game. This I think is the most fun of designing your own game, that is the invention of your symbols, your rules, and doing all your own research. Just my written rules are over ten typed pages! This is not taking into account all the many, many rules that are just 'common law' rather than written down.

There is only one game with extensive air forces and this is *Midway*. However, if you were to adopt the *Midway* system to land battles there would have to be some changes made. The role of the air forces in a land-battle game would be one of helping out with

attacks, possibly shooting up supply wagons, roads, railroads, ports and other tactically important targets. This would mean that if the game were down on the division level, the air forces would be able to toss in points to be added to the attacker or the defender's sides. With air forces it would be possible to make a 15—6 into a 3—1 by just providing three points' worth of bomber and fighter-bombers from an air base that is within range of the battle. On the other side, of course, the defender would be able to place part of his air force over a weak point in his line to boost it up. This defender's aircraft would be able to add to the defence of the ground troops unless this defending aircraft was dealt with by the attacker's aircraft.

The aircraft would play a larger role if you had a larger game such as are many home-made games that a lot of you have. In these games where you have a navy the air force takes on an additional load of bombing ships at sea, or bombing ships being repaired in port, and the like. This involves co-ordination to be able to fit the different speeds at which land troops, ships and aircraft travel into a single turn.

With aircraft come many support facilities which should be taken into account for accuracy. One is air bases, for they must be able to be constructed and dismantled. Another is the anti-aircraft battalions, for with aircraft comes the counter-weapon. Also there must be a system of interception developed so that incoming raids may be met and destroyed, if possible. Also there must be a system of replacement and coupled with this are the factories for producing the replacement aircraft. This brings in part of the incentive for long-range bombing attacks on industry which played such a vital part in the last World War. For any player would like to destroy his opponent's means of advantage, and having an air force with a full replacement rate is one of them. There are many problems to be worked out with air forces, but this article was written just to show the possibilities of introducing aircraft into a game.

Since this book was first published in 1966, there have been many interesting board games on air warfare. This is a selection of a few of the best known classics.

B-17: Queen of the Skies was a game by Avalon Hill that aimed to recreate the early bombing missions of a B-17 (model F) of the 8th Air Force on the bombing missions in 1942-43. Movement is through the various zones and random dice rolls determine the appearance and type of enemy fighters. Detailed charts are used to determine the chance of hit and the amount of damage. Dice rolls determine the weather, flak, other aircraft etc. The game is interesting, but lacks decision making which reduces the solo wargaming experience.

The original B-17 game

Luftwaffe was an Avalon Hill game that stood the test of time and remained popular for many years.

The game begins in 1943 at the start of the heavy bombardment of the German Third Reich. The map shows the Low Countries to Poland, with the primary targets being cities. The Germans position their fighters at airfields around the map and wait for the pre-planned American attacks. This is a strategic level game, not a game about tactical air combat. A game of planning and executing bombing raids over Europe, seeking to stop them and shooting down the bombers before they reach their targets. Decision Games have re-released this classic.

RAF the Battle of Britain, 1940 by Decision games is another updated classic.
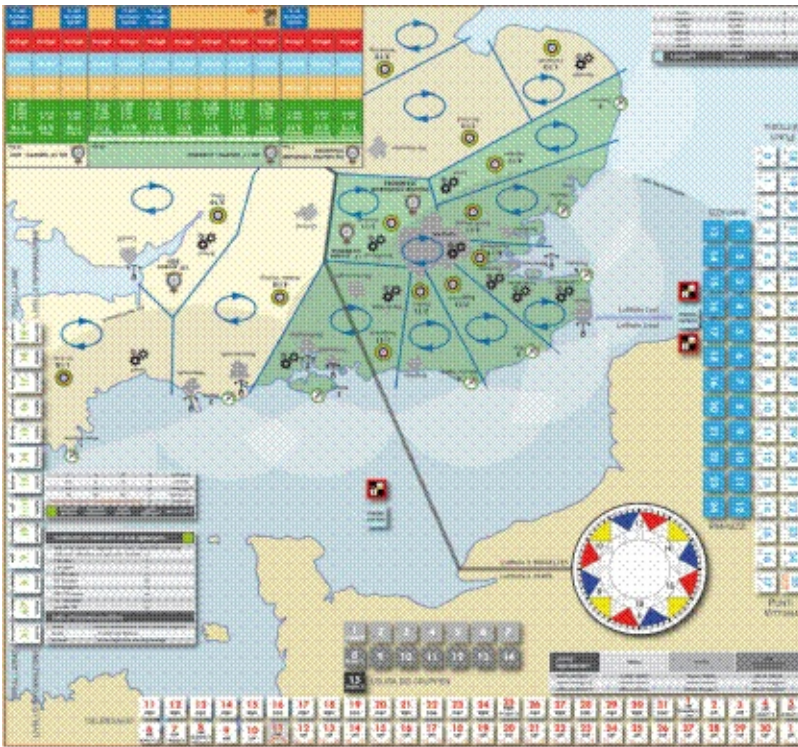
The game is unusual as it is made to allow the player to play either the British or the German side as a solo game or in the traditional two player format. The game is detailed and makes a surprisingly good solo game. Playing the German side while solo is perhaps more interesting as there are a larger number of decisions to make. As the German commander you draw target cards to reflect the German High Command's priorities, and then plan the day's operations. Larger formations are more likely to damage the target, but may not form up properly. Small formations are vulnerable to being jumped by the RAF.
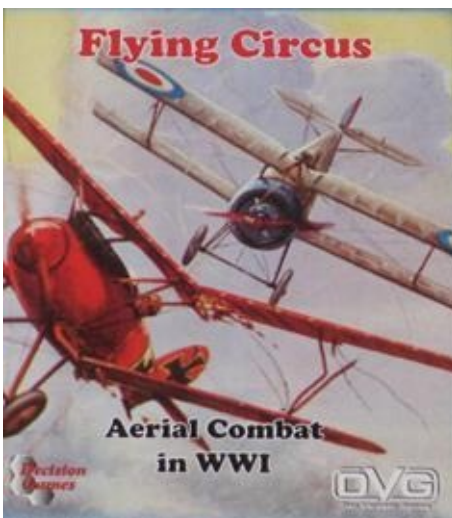
Flying Circus: Aerial Combat in World War I is by Decision Games and comes in a basic and deluxe edition. The game involves flying the key aircraft from WWI in aerial duels to multi-aircraft dogfights. Feedback indicates that many players recommend getting the full game version as the basic version is fun, but lacks the entertaining chrome that makes the period so much fun to play.

No review of classics would be complete without mentioning *Ace of Aces*. This game was a book-based system that simulated individual dog fights from World War I. Each player has their own book from which they select their own manoeuvre (barrel roll, dive, climb etc.). They then inform their opponent who cross references their manoeuvre with their opponent's which tells them to which page to turn. The series was very successful and spawned many variants, including one for World War II and a modern jet fighter based game.

In recent years there have been many computer games dealing with air combat, but the speed of developments is so great it is hard to see how any reference to a now popular game would still be relevant in even a few years' time. The first game the editor played was a Spitfire flight simulator for the BBC micro. Despite the crude graphics it was realistic enough for real veteran Spitfire pilots to be able to fly the computer Spitfire and engage the only opponent, a flying saucer. The game epitomised the paradox of computer flight games. If the aircraft is so realistic to fly, it takes a similar amount of time for computer game player to learn to fly it. It can take even longer for the player to learn how to fly the aircraft well enough to last long enough in a dogfight to shoot down the enemy. Not all wargamers are willing to spend ten or more hours mastering the takeoff and landing aspects of a simulator before taking to the skies to find the enemy.

The Microsoft Flight Simulator range of games have offered a long lasting aircraft flying experience, but there are many others e.g. *Tom Clancy's Hawk Air* Combat game. Such computer based games allow the wargamer to have a unique perspective on air-combat from the cockpit. One computer game was used to 'recreate' the Battle of Britain with over a thousand players across the world taking part (leading to more aircraft flying than in the real Battle of Britain). The games were set on three consecutive Sundays in real time, with the air battle commencing in the morning and lasting to the evening. With a realistic chain of command down to individual squadron commanders the two sides spent weeks of planning. The game was not a wild success: some players and their squadrons spent fruitless hours hunting for the enemy (and as the game was set in real time, a two hour patrol meant flying your simulated plane for two real hours). Some bombing missions were not opposed, which meant the escort fighters saw no-one for the three hour attacks. Finally, the first day ended badly as the inexperienced defending British commander failed to allocate sufficient fighter cover to protect the British airfields, so most were knocked out by the end of day one. The game organisers halted the game and allowed a free for all for the next two Sundays. This illustrated that large, megagames do

not always give a good experience for all the players and sometimes a realistic model for individual air-combat, does not realistically portray an air campaign when scaled up.

16: *Sturmstaffel*: Defending the Reich 1944

This is an interesting game developed by Tim Gow, author of *Megablitz*, who, along with other members of the British based Wargame Developments group ran it as a participation game at many UK wargaming shows. It combines elegant simplicity with key decisions to simulate fighters attacking daylight bombers. It demonstrates that air wargames can be exciting and are accessible to any wargamer. It is reproduced with permission.

The game is designed for between one and six players, so it requires up to six model fighters and a bomber stream in a grid of six by seven squares.

The game is set on the 6th of March 1944. The American 8th Air Force Mission No.250 is heading for Berlin with a strength of 730 heavy 'terror' bombers (B-17s and B-24s) escorted by 800 fighters.

The *Luftwaffe* committed 18 *Jagdgruppen*[43] (Fighters Bf 109 and FW 190), 3 *Zestorergruppen* (Heavy fighters, Me 410 and Bf 110), 4 *Nachtjagdgruppen* (Night fighters, Bf 110 and Ju 88) and various other smaller units to disrupt the American raid.

Sturmstaffel 1 was formed in November 1943 from volunteer pilots and has been particularly successful in attacking the enemy bombers. On the date of the game the *Staffel* is assumed to commit between 1 and 6 FW190A fighters to the day's action (the actual number is dependent on the number of players, with each player commanding one aircraft).

There should be one bomber in each square that is not adjacent to the edge of the board. i.e. 24 bombers.

Suitable paper 'top down' aircraft models can be downloaded from http://www.juniorgeneral.org. Look under paper soldiers, then top-down.

As a way of introducing pressure, the game should last for 30 real minutes, with the number of turns dependent on how fast the players learn the game and act decisively. After 30 minutes, surviving fighters are assumed to disengage and return to base to refuel and rearm for the next day. It is possible for a well coordinated attack to shoot down all the bombers; it is equally possible for all the German fighters to be lost.

Player briefing The players must be informed of the serious nature of their mission and should be read the following statement.

'I have volunteered for the *Sturmstaffel* of my own free will. I fully understand the fundamental principles of the *Staffel*.

1. All attacks will, without exception, be carried out in formation and to within the closest possible range of the enemy.

2. Losses suffered during the approach will be compensated for by immediately closing up on the formation leader.

3. The enemy under attack is to be shot down from the shortest range possible, or, if this is unsuccessful, destroyed by ramming.

4. The *Sturm* pilot will remain in contact with the stricken enemy until the point of impact with the ground has been established.

I voluntarily accept the obligation to abide by these principles, and will not return to base without having destroyed my enemy. Should I violate these principles, I am prepared to face court martial or dismissal from the *Staffel*.'

A German FW190 engaging the Americans most closely by flying through the middle of the bomber stream. 1/300 models painted by Nick Mitchell. Photo by Tim Gow.

Umpire Guidelines

Appoint a *Staffelkapitan*. There clearly needs to be a leader and the players should appoint the most experienced fighter pilot they have.

The *Staffelkapitan* should decide the direction of approach. If they hesitate, the umpire should force the *Staffel* to attack head-on as the players have clearly run out of planning time.

The FW190s should be arranged along the board edge reflecting their direction of approach, each plane in a separate square.

Sequence of play

1. Existing damage

Any aircraft that has *existing* damage should roll one die. Rolling a 1 removes it. Any 6's should be rolled again – a further 6 means the aircraft is crippled (*Herausschuss*). Crippled aircraft must disengage and then roll again per damage dice; a 6 means they crash or explode. Every turn crippled aircraft should roll to remove damage (any die with a 1 is removed), Cripples which roll a 6 on existing damage dice explode.

2. Move Fighters

The heart of the game is the fighter movement relative to the direction of the bomber stream. The bombers never move unless they are crippled.

A fighter may turn 90˚ at the end of a move. Only one fighter may occupy a square (although this may also contain a bomber). Starting with the leader and working around clockwise, each aircraft is moved in turn.

Each fighter starts in A1, B1, C1 or D1 relative to the bomber stream. They can move to any relative square marked 2.

A1 – Flying in the same direction as the bombers – fighter A1 may end up in any square marked A2.

B1 – Flying at right angles to the bombers – fighter B1 may end in any square marked B2

C1 – Head on to the bombers – fighter may end in any square marked C2

D1 – Cripples – drop back by 1 square to D2 as above.

F1 – Refers to firing, see Fighter Attacks later in the rules

		↑ Direction of bombers	C1 ▼			
A2	A2	A2		B1 ►		
	A1 ▲ A2				B2	
	A2		C2			B2
F2	F2	F2	C2		▲ D1	
	▲ F1 F3		C2		D2	

3. Bombers Fire

"You didn't have to aim, just stick your gun out the window and pull the trigger." – Capt. Robert D Brown, 390 Bomb Group.

Bomber gunnery is resolved per fighter. Umpire rolls 1D6 per bomber in the same or adjacent (diagonal or orthogonal) square.

Gunnery results:

All targets are hit on a 6 – place a damage dice on target.

Crippled bombers are hit on a 4, 5 or 6 – place a damage dice on target.

4. Fighters Attack

Refer to movement table 2, above. Fighter in F1 may fire at a single bomber in any of the squares marked F2 or F3. Ramm attacks may only take place in F3.

Roll dice depending on the range as follows:

1 Square range   =   6 D6[44]

Same Square gunnery   =   10 D6

Same Square Ramm attack   =   20 D6 (plus 4 D6 on self)

Resolve firing as per 'Gunnery Results' above.

5. Baling out

A player may choose to bale out of a crippled fighter. This is resolved using the 'Play Your Cards Right' mechanism made famous by the Wargame Developments game of the same name.

The umpire reveals the top card of a deck, announces the next action and the player must successfully guess 'higher' or 'lower' to complete that action.

The actions are as follows:

Open canopy

Unbuckle harness

Climb out of cockpit

Open parachute

Land safely

Avoid being pitchforked by irate farmers

The game ends when the first of the following events occurs:

1. All bombers are shot down.

2. All fighters are shot down.

3. 30 minutes have elapsed

Historically, on this day the 7 aircraft of *Sturmstaffel 1* shot down 13 bombers.

17: Rolling Thunder: Air combat over South-East Asia

Rolling Thunder was devised by Ian Drury; a wargamer who has devised many original wargames over the years. This particular game is an excellent example of a combination of a board and a figure game.

The playing area required is a large hex map, using whatever models (or counters) the player has to hand. A pack of cards is also required. The rules are reproduced with permission.

Suitable paper 'top down' models can be downloaded from http://www.juniorgeneral.org. Look under paper soldiers, then top-down.

Rolling Thunder by Ian Drury

Historical Background

"We will not be defeated. We will not grow tired. We will not withdraw, either openly or under the cloak of a meaningless agreement," said President Lyndon B Johnson, referring to America's commitment to South Vietnam in April 1964. In 1965 he ordered the bombing of selected targets in North Vietnam in an attempt to dissuade Ho Chi Minh's regime from supporting the insurgency. By the time he called off the bombing in November 1968, America was defeated and tired, although it took another five years – and a new president – to achieve a meaningless agreement under which to withdraw.

That may sound a cynical judgement, but Rolling Thunder, as the campaign was named, created a generation of cynics. Johnson coined the now infamous phrase 'plausible deniability'. Colonel Robin Olds was a World War II fighter ace now leading USAF flights into the North. He was alert to the numerous ironies in these missions: spare a thought for pilots, he wrote, "..flying a Navy plane [F-4 Phantom] carrying World War II bombs, a gun sight in front of my face not as good as the one I had in P-38s, and going up there to bomb some railroad yard. We'll face a sky full of flak, missiles and MiGs, but don't worry about it, because I've got it on good authority that none of this is happening."

Targets were selected by a small team in the White House. Missions were organized by a remote, cumbersome command structure. Unsuccessful attacks were often ordered to be repeated, maximizing the danger for American fliers. President Johnson halted the bombing so often that even the USAF official history cannot decide how many 'bombing halts' there were. They were intended to encourage the North Vietnamese to stop the war, but the ignorant Communists just interpreted them as lack of resolve.

The list of rules of engagement became ever longer, partly from fear of bringing China or Russia into the war. There were several engagements between Chinese MiGs and US aircraft, and as in Korea, there were phases when the defending fighters simply withdrew into Chinese airspace and were repaired on Chinese airfields. But the logic of other rules defied explanation. MiGs could not be attacked on the ground: for a long time their airfields were off limits. Most ridiculously, SAM (Surface-to-Air Missile) sites could not be attacked while under construction. Pilots had to wait until there were SAMs in the air

before they could retaliate. One fighter ace was court martialled for strafing a Soviet freighter in Haiphong harbour – during a low level dogfight with MiG-17s. Like the recent prosecutions of British soldiers for alleged war crimes in Iraq, the enthusiasm with which some US officers sought to punish certain fliers for breaking the ROE led to doubts as to which side they were fighting for. More than one pilot's wife received a notice of her husband's court martial within days of notification that the man was already dead, killed on a subsequent mission.

President Johnson built USAF bases in Thailand that were notionally Royal Thai Navy stations. USAF aircraft flew to the North from these bases while the US Navy positioned carrier air groups offshore on 'Yankee Station'. The two services fought very different wars, coordinated by different chains of command and using different aircraft and tactics. Not until the 1990's could Navy aircraft refuel from a USAF tanker or vice versa. The aircraft based in Thailand also conducted a parallel campaign over Laos, one that would remain secret for some time yet.

In round numbers, Rolling Thunder involved about one million sorties and involved the loss of just under a thousand aircraft. By November 1968 there were several hundred American airmen incarcerated in appalling conditions in Northern prison camps. They would have to endure until 1973 when the survivors were released. (The fate of airmen who ejected over Laos remains controversial.)[45] Vietnamese casualties remain speculative; there was some spectacular damage inflicted to the country's infrastructure, but the effect of the campaign on North Vietnam's capacity to wage war on the South was minimal.

The Game

One has to respect anyone bold enough to clamber into a MiG-17, armed only with cannon, to take on the veteran fliers of the USAF or US Navy in the best combat aircraft in the world. The Vietnamese were too light for the ejection seats, built for beefy Slavic types, and the manual controls demanded great physical strength. Vietnamese AAA was as indiscriminate as American flak in 1944–5 and shot at everyone and everything. However, the tables were briefly turned during Rolling Thunder. Between October 1967 and March 1968, North Vietnamese MiG-21 pilots racked up a score of nearly 3:1 in their favour. Outdated USAF tactics, a replacement policy that broke up veteran squadrons and some ridiculous rules of engagement handicapped the Americans. The pilot shortage, like the bomb shortage, was known to aircrew but officially denied in Washington. Nevertheless, by judicious exploitation of the Mach 2 MiG-21 and some gutsy flying in MiG-17s, the Vietnamese put up quite a fight.

The Vietnamese air defence system comprised three elements that became increasingly well-coordinated. Hanoi and Haiphong were protected by the heaviest concentration of flak ever seen – and many of the senior American pilots had flown over Berlin in 1944–45, so they knew what they were talking about. If the US aircraft stayed high to minimize flak losses, they were exposed to SA-2 SAMs of which the Vietnamese had more than twenty regiments. Aircraft targeted by a SAM could dive to low level to break the radar

lock, but risk ground fire; alternatively, they could fly in close formations in which the concentration of ECM pods would defeat the SAMs' radar. Maintaining tight formation takes great skill but makes it difficult to keep much of a look-out: they were horribly vulnerable to being bounced by enemy fighters, particularly once the Mach 2 capable MiG-21 arrived on North Vietnamese airfields.

The dogfight rules are intended to reflect the broad trends of aerial combat over North Vietnam. Nearly half the MiGs and more than half the US aircraft that were shot down never manoeuvred while under attack; if they saw their attacker(s) at all, it was too late. The MiGs are much smaller aircraft and many American planes, notoriously the F-4 Phantom, made so much smoke in full military power that their thick, black exhaust trails could be seen at up to thirty miles! The US air-to-air missiles (AIM-9 Sidewinder and AIM-7 Sparrow) enjoyed hit rates of more than seventy per cent in peacetime tests, but hit rates over Vietnam were closer to seven per cent. Both the Navy and Air Force had opted for all-missile fighters before the war started, believing that the era of the gun was over. Poor experiences with missile reliability led to calls for guns to be re-installed, so USAF F-4s sported gunpacks and later versions included an integral 20mm 'Gatling gun'. However, some aircrew stuck happily with their missiles and several pilots scored multiple kills, never regretting the absence of cannon on their aircraft.

The air-to-ground rules reflect the difficulty of hitting pinpoint targets, like bridges, with iron bombs. Early guided weapons received their first combat use during Rolling Thunder, and by the time operations against the North were resumed by Nixon, the first laser-guided bombs were in service. The Nintendo era of air warfare had truly begun.

At the centre of the game system is the use of a deck of cards. The ♥♣♦♠ symbols are used as follows:

<div align="center">

Hearts ♥

Clubs ♣

Diamonds ♦

Spades ♠

</div>

CIA map of Vietnam and Laos (2003)

AIRCREW GUIDE (Players' Guide)

It is useful to hand the players a brief guide to the rules prior to the start of the game; the umpire is the only one who is needed to be conversant with the full rules.

"Think about us – flying a Navy plane, carrying World War II bombs, a gun sight in front of my face not as good as the one I had in P-38s, and going up there to bomb some railroad yard. We'll face a sky full of flak, missiles and MiGs, but don't worry about it because I've got it on good authority that none of this is happening."

Colonel Robin Olds USAF

Bombloads

Bombloads are as follows. Specify whether standard bombs or cluster bombs

USN F-4B, F-100F WW,F-105WW	1
F-105D/G, F-8, AH-1	2
F-4C/D/E, A-4, A-7	3
A-6	4
F-111, B-52G	6
B-52D	30

ARM loads are as follows per plane in flight

F-100F Wild Weasel   1 x Shrike (from April 1966)

F-4C Wild Weasel/A-7/A-4/A-6   2 x Shrike

Air-to-air ordnance per fighter flight is as follows:

Aircraft	Cannon shots	IR missile shots	RH missile shots
F-100 Super Sabre	4	0	0
F-105 Thud	4	2	0
F-105WW	4	0	0
F-4B Phantom (USN)	0	4	4
F-4C Phantom(USAF)	4	4	4
F-8 Crusader	2	2	0
A-4 Skyhawk	2	0	0
A-7 Corsair	4	2	0
A-1H Skyraider	6	0	0

PAVN

Aircraft	Cannon shots	IR missile shots
MiG-17	2	0
MiG-19	2	0
MiG-21F-13	2	2
MiG-21PF & PFM	0	2
MiG-21MF	4	2

Movement

1. Deal a card to each SAM site or radar-directed AAA unit that did not suffer damage last turn and elects to turn on its radar. Deal a card to each flight on the table. Adjacent flights of the same type can draw one card.

2. Flights are detected by the enemy radar network depending on the suit of their activation card. This occurs before the first unit or flight is activated.

- Undetected PAVN flights are detected if they are dealt a ♠ at medium/high altitude; A, K, Q, J ♠ if at low/deck.

- Detected PAVN flights become undetected if they are not adjacent to a US flight and are dealt a ♥ at low or ♥ ♦ if on the deck.

- Undetected US flights are detected on ♥ or ♦ at medium/high or a ♥ if at low or deck

- Detected US flights become undetected if they are not adjacent to a PAVN flight and are dealt a ♠.

3. Activate in whist sequence (♥ ♣ ♦ ♠) starting with Aces. Jokers go at any time.

4. Movement speeds in hexes are as follows, the top line is for an aircraft not carrying a bombload, the bottom line for flights carrying a bombload. Speeds for flights on the deck are the same as at low. Helicopters move at speed 1.

USAF

Aircraft	Norm			Max		
	low	Med	high	low	med	high
F-4 Phantom	4	4	4	5	6	7
	3	3	3	4	5	5
F-100F Wild Weasel 1	3	4	4	4	5	6
	2	3	3	3	4	4
F-105D Thunderchief	4	5	5	5	6	7
	3	4	–	4	5	–
F-111 Aardvark	4	5	5	5	6	7
	3	4	4	4	5	5
A-1H Skyraider	1	1	1	2	2	1
	1	1	–	2	2	–
RF-101 Voodoo	4	5	5	5	6	7

US Navy

Aircraft	Norm			Max		
	low	Med	high	Low	Med	High
F-4 Phantom	4	4	4	5	6	7
	3	3	3	4	5	5
A-4, A-6 & A-7	3	4	4	4	4	4
	2	3	–	3	4	–
F-8 Crusader	3	4	4	4	6	6
	3	3	–	4	4	–
EA-6B	3	4	4	4	4	4

PAVN (People's Army of Vietnam)

Aircraft	Norm			Max		
	Low	Med	High	Low	Med	High
MiG-17	3	3	3	4	4	4
MiG-19	3	4	4	4	5	6
MiG-21	3	4	4	4	5	6

Flights use 12 point facing. When moving across the grain of the hex grid, side-slip into either of the available hexes.

A turn may be made in each hex moved. A free turn has no effect on subsequent movement. Flights that make a turn greater than their free limit lose 1 hex of forward movement.

Speed	Free	Maximum
1–2	90	180
3–4	60	120
5+	30	90

Diving 1 or 2 levels is free; a third level costs 1 hex of forward movement. Climbing 1 level is free. Additional levels cost 1 hex of movement and require the flight to be at max speed and unloaded.

3. Fuel

Keep count of the number of turns aircraft fly at maximum speed: only a few can afford to keep the afterburners lit for the whole mission. If the limits shown here are exceeded, the aircraft may fail to recover to base.

USAF fuel limits:

F-4C/D, F-104, F-105	5
F-111A	15
B-52, EB-66, AH-1H	unlimited

US Navy

F-4B, F-8	5
A-4, A-6, A-7, EA-6	10
RA-5C	15

5. Detection

A flight may make one detection attempt against each enemy flight or ground site within range at any point during its turn.

1. US aircraft trying to detect PAVN aircraft: roll a D10 & score 5 or less to detect a flight within 5 hexes. +1 to die roll if PAVN at lower altitude than US and/or in rear arc, +2 if on the deck, −1 if adjacent.

2. F-4 search radar v targets up to 12 hexes away: if PAVN flight is in the F-4's forward arc, roll D10 and score 5+ to detect. −1 if PAVN more than 6 hexes away, −1 at lower altitude, −2 on deck.

7. Anti-Aircraft Artillery

AAA batteries have a horizontal range of 1 hex. Radar-directed AAA batteries have a range of 2 hexes.

8. SAMs

"There is nothing absolutely nothing, to describe what goes on inside a pilot's gut when he sees a SAM get airborne."

Randy 'Duke' Cunningham

SAM radars have a max range of 12 hexes. SA-2s have a minimum range of 2 hexes and a max range of 8 hexes.

9. Ejecting

"It is generally inadvisable to eject directly over the area you just bombed."

USAF Manual

NVA AA- 57mm (top) 100mm (middle), SAM (bottom)

Source: Centre for Airforce History 2005

Full Rules

"We will not be defeated. We will not grow tired. We will not withdraw, either openly or under the cloak of a meaningless agreement."

President Lyndon Johnson, April 1964

"Think about us – flying a Navy plane, carrying World War II bombs, a gun sight in front of my face not as good as the one I had in P-38s, and going up there to bomb some railroad yard. We'll face a sky full of flak, missiles and MiGs, but don't worry about it because I've got it on good authority that none of this is happening."

Colonel Robin Olds USAF

1. Set up

Equipment: D10s, D6s and several packs of cards. Use one pack for bombing/firing missiles and another for movement sequence. Markers are required for flights undetected by the enemy radar network and for US flights that SAM batteries have successfully locked-on to. Flights' altitude is shown by means of a poker chip or similar: green = on the deck; red = low; white = medium; blue = high. Deploy SAM sites and AAA positions on

table. Some should be dummies. In an umpired game, a few sites can be concealed (marked on a map). The US player notes entry hexes and entry times for all flights and fills in a log sheet for each flight, showing flight number, code-name, the number of aircraft in the flight, and bombload or air-to-air armament. Use this sheet to mark damage, expended fuel etc.

2. Movement sequence

Flights beginning the game undetected are represented by a numbered counter. Both sides can introduce a number of dummy flights at the beginning of the game.

1. Deal a card to each SAM site or radar-directed AAA unit that did not suffer damage last turn and elects to turn on its radar. If the unit shut down its radar last turn and it draws a ♠ it stays shut down this turn too.

2. Deal a card to each flight on the table. Adjacent flights of the same type can draw one card, e.g. the bombers in a strike package.

3. The suit of a flight's activation card determines whether the flight is detected or undetected by the other side's radar network.

- Undetected VPAF flights are detected if they are dealt a ♠ at medium/high altitude; A, K, Q, J ♠ if at low/deck.

- Detected VPAF flights become undetected if they are not adjacent to a US flight and are dealt a ♥; if on the deck a ♥ ♦.

- Undetected US flights are detected on ♥ or ♦ at medium/high or a ♥ if at low or deck

- Detected US flights become undetected if they are not adjacent to a VPAF flight and are dealt a ♠; if on the deck a ♠ or ♣.

4. Activate flights and ground units in whist sequence (♥♣♦♠) starting with Aces, then 2s etc. Jokers can go at any time. A flight engaged by an enemy flight in a dogfight before playing its card, loses its card.

5. SAM sites dice to lock-on to the nearest detected US flight. If already locked-on, an activated SAM site may launch a missile: place a missile launch marker on the site and resolve the shot.

6. Flights may try to detect enemy aircraft by visual means or radar at any point during their activation, but only once per method per enemy flight. A flight detected in this way loses its undetected marker (the detecting flight passes the information up the command chain). When a SAM site or radar-directed AAA unit has been activated, leave its card in the hex (inverted) to show the radar is on.

7. Movement speeds in hexes are as follows, the top line is for an aircraft not carrying a bombload; the bottom line for flights carrying a bombload. Speeds for flights on the deck are the same as at low. Helicopters move at speed 1.

USAF

Aircraft	Norm			Max		
	low	Med	high	low	Med	high
F-4 Phantom	4	4	4	5	6	7
	3	3	3	4	5	5
F-100F Wild Weasel 1	3	4	4	4	5	6
	2	3	3	3	4	4
F-105D Thunderchief	4	5	5	5	6	7
	3	4	–	4	5	–
B-52 Stratofortress	2	3	3	3	3	3
	2	2	2	3	3	3
F-111 Aardvark	4	5	5	5	6	7
	3	4	4	4	5	5
A-1H Skyraider	1	1	1	2	2	1
	1	1	–	2	2	–
RF-101 Voodoo	4	5	5	5	6	7

US Navy

Aircraft	Norm			Max		
	low	Med	high	Low	Med	High
F-4 Phantom	4	4	4	5	6	7
	3	3	3	4	5	5
A-4, A-6 & A-7	3	4	4	4	4	4
	2	3	–	3	4	–
F-8 Crusader	3	4	4	4	6	6
	3	3	–	4	4	–
EA-6B	3	4	4	4	4	4
RF-5A Vigilante	4	5	5	5	6	7

VPAF

Aircraft	Norm			Max		
	Low	Med	High	Low	Med	High
MiG-17	3	3	3	4	4	4
MiG-19	3	4	4	4	5	6
MiG-21	3	4	4	4	5	6

Flights use 12 point facing. When moving across the grain of the hex grid, side-slip into either of the available hexes.

8. A turn may be made in each hex moved. A free turn has no effect on subsequent movement. Flights that make a turn greater than their free limit lose 1 hex of forward movement.

Speed	Free	Maximum
1–2	90	180
3–4	60	120
5+	30	90

9. Diving 1 or 2 levels is free; a third level costs 1 hex of forward movement. Climbing 1 level is free. Additional levels cost 1 hex of movement and require the flight to be at maximum speed and unloaded.

3. Fuel and Ammunition

Keep count of the number of turns aircraft fly at maximum speed: only a few can afford to keep the afterburners lit for the whole mission. If the limits shown here are exceeded, the aircraft may fail to recover to base.

USAF fuel limits:

F-4C/D, F-104, F-105	5
F-111A	15
B-52, EB-66,AH-1H	unlimited

US Navy

F-4B, F-8	5
A-4, A-6, A-7, EA-6	10
RA-5C	15

VPAF

MiG-17F	12
MiG-19, MiG-21F, MiG-21PMF, MiG-21MF	7

Aircraft		8
MiG-21PF		8

Bombloads are given in rule (15). Air-to-air ordnance per fighter flight is as follows:

Aircraft	Cannon shots	IR missile shots	RH missile shots
F-100 Super Sabre	4	0	0
F-105 Thud	4	2	0
F-105WW	4	0	0
F-4B Phantom (USN)	0	4	4
F-4C Phantom(USAF)	4 (with gunpod)	4	4
F-8 Crusader	2	2	0
A-4 Skyhawk	2	0	0
A-7 Corsair	4	2	0
A-1H Skyraider	6	0	0

Aircraft	Cannon shots	IR missile shots
MiG-17	2	0
MiG-19	2	0
MiG-21F-13	2	2
MiG-21PF & PFM	0	2
MiG-21MF	4	2

4. Breaking radar lock-on

A US flight that a SAM site has locked-on to may try to break the lock-on at the end of its turn provided it does not exceed its free turn limit. By reducing forward speed 1 hex it can make evasive manoeuvres. Roll a D10 and score ≤1

–1	Flight is EA-6 or B-52G	+1	SAM radar within 2 hexes
–2	Making evasive manoeuvres	+2	Flight has no ECM e.g. A-1H or
–2	On deck		Wild Weasel or helicopter

5. Detection

A flight may make one detection attempt against each enemy flight or ground site within range at any point during its turn. US aircraft, MiG-17s and MiG-19s can see all round; MiG-21s can only attempt to detect flights in their forward 60 degree arc.

1. VPAF aircraft detecting US flights: roll D10 & score 6 or less to detect a target within 6

hexes, –1 if adjacent and/or US flight is in afterburner, +2 flight is helicopter

2. US aircraft trying to detect VPAF aircraft visually: roll a D10 & score 5 or less to detect a flight within 5 hexes, +1 VPAF at lower altitude, +1 VPAF on deck.

3. F-4 search radar v targets up to 12 hexes away: if VPAF flight is in the F-4's forward arc, roll D10 and score 5 or less to detect. +1 if VPAF more than 6 hexes away, +1 at lower altitude, +2 on deck.

6. Air-to-air combat

Flights can engage in three ways: (1) BVR (Beyond Visual Range) attacks with radar-guided missiles; (2) high speed 'slash attacks'; (3) 'dogfights'.

1. BVR engagements: An F-4 that has detected an enemy flight on radar may make one attack with AIM-7 Sparrow missiles at any point during its activation. Draw a card and get an Ace of the suit shown to hit. Any red card = draw again (optional). Any black card = cease fire, radar lock-on has broken. A Black picture card = flight has expended all its AIM-7s. *Note that US Rules of Engagement often demand visual identification of the target flight.*

MiG at medium or high	A ♥ ♣ ♦ ♠
MiG at low	A ♥ ♦
MiG on deck	A ♥

2. 'Slash attacks' take place during a flight's move. The attacking flight must have moved at maximum speed the previous turn and do so again the turn it attacks. It must have sufficient movement to move through the target flight at the same altitude. It must have visually acquired the target at some point during its turn. Not all fighters are fast enough to make such an attack: MiG-17s, A-4s, A-7s and (sorry, guys!) A-1Hs are not permitted to make a slash attack.

Roll a D10

+1 attacking from target's rear arc

+2 attacking into target's rear hexside

+2 target flight is scattered, in close formation or made bomb attack this turn

+2 attacking flight is undetected

Score 1–5 = no firing pass, attacker flies through defender's hex with no firing.

Score 6–9 = firing pass: draw 1 card

Score 10 = firing pass: draw 2 cards

Score 11+ = firing pass: draw 3 cards

Rookie pilots hit on an Ace; Average pilots AK; veterans AKQ; Top Gun: AKQJ

Roll for ammunition depletion for IR missiles if so equipped, else cannon.

3. Dogfights

Close-in fights occur when a flight enters the same hex as a hostile flight. It is not necessary to visually detect an enemy flight in order to initiate a dogfight. The attacking flight rolls a D10 to determine how successful it is.

Situation:	A	B	C	D	E
VPAF attack	1 or less	2	3–4	5–7	8+
US attack	0 or less	1	2–6	7–8	9+

Attack die roll mods:

–1 target flight is veteran or top gun

–1 attacking flight is flown by rookie pilots

+1 target flight has damaged aircraft

+1 attacking flight is undetected

+2 target flight has crippled aircraft

+2 attacker or defender has performance advantage:

Altitude	Aircraft engaged in combat
Low or deck	• MiGs v loaded US aircraft
Medium	• MiGs v loaded US aircraft • MiGs v A-1 Skyraider • MiG-19/21 v A-6 or A-7
High	• MiGs v loaded US aircraft • MiG-21 v F-100/F-105/A-6 or A-7 or B52 • F-8/F-4/F-105.F-100 v MiG-17

	USN*	AKQJ♥♣♦	AKQJ♥♣♦	AKQJ♥♦	A♥	–
Defender	USAF	AKQJ♥♣♦	AKQ♥♣♦	AKQ♥♦	A♥	–

		A	B	C	D	E
	VPAF	AKQJ♥♣♦	AKQ♥♣♦	AKQ♥♦	A♥	–
Attacker	USN*	–	A♥	AKQJ♥♦	AKQJ♥♣♦	AKQJ♥♣♦♠
	USAF	–	A♥	AKQ♥♦	AKQ♥♣♦	AKQ♥♣♦♠
	VPAF	–	A♥	AKQ♥♦	AKQ♥♣♦	AKQ♥♣♦♠
		He's on my tail!	Watch your 6!	Even fight	Switching to guns	Perfect bounce!
		A	B	C	D	E

* F-8 and F-4s: other USN flights use USAF line

VPAF flights draw 1 card for rookie/average pilots, 2 for veteran/top gun

US flights draw 1 card for average pilots, 2 for veterans, 3 for top gun

USN fighter flights draw 2 for average pilots, 3 for veterans, 4 for top gun

Draw a card for each hit:

- ♥   1 aircraft damaged

- ♦   1 aircraft crippled

- ♣   1 aircraft shot down, pilot ejects a D6 hexes away (his choice)

- ♠   1 aircraft shot down, pilot KIA

When assigning hits to a flight, roll randomly but count damaged aircraft as two and crippled as four.

Ammunition Expenditure

Roll a D10 for each flight that participated in a dogfight. 1–3 = expend 1 point of ammunition; 4–6 expend 2; 7–9 expend 3; 0 = expend 4

7. Anti-Aircraft Artillery

AAA batteries have a horizontal range of 1 hex. Radar-directed AAA batteries have a range of 2 hexes. Ground fire from infantry weapons can only hit aircraft flying through the same hex. SA-2 batteries have integral batteries of light AAA for local defence. AAA engages all aircraft passing within range. VPAF flights draw a card if shot at by their own

AAA: ♥♦ = gunners cease fire ♠♣ = gunners fire. A flight that begins, ends or spends any part of its move, within range of an AAA site rolls a D10, once per site, for damage:

	Small Arms	SAM battery	AAA site	Radar-directed AAA
Deck	1	1	1–4	n/a (cannot track)
Low		1	1–2	1–4
Medium		1	1	1–3
High			1	1–2

+1 AAA or SAM site damaged/+2 badly damaged

–1 target flight is dive-bombing in same hex as AAA

–1 target flight is undetected

–2 target flight is pressing home a dive-bombing attack in same hex as AAA

Roll a D10 for damage

1	1 aircraft shot down
2–3	1 aircraft crippled
4–5	1 aircraft damaged
6–7	1 aircraft jettisons non-ARM or Air-to-Air ordnance
8+	No effect

8. SAM's

"There is nothing absolutely nothing, to describe what goes on inside a pilot's gut when he sees a SAM get airborne."

Randy 'Duke' Cunningham

Col. Robin Olds with F-4C 'Scat XXVII'
USAF Museum Photo Archives

> "When I took over my wing [in Vietnam], the big talk wasn't about the MiG's, but about the SAM's … I'd seen enemy planes before, but those damn SAM's were something else. When I saw my first one, there were a few seconds of sheer panic, because that's a most impressive sight to see that thing coming at you. You feel like a fish about to be harpooned. There's something terribly personal about the SAM; it means to kill you and I'll tell you right now, it rearranges your priorities … We had been told to keep our eyes on them and not to take any evasive move too soon, because they were heat-seeking and they, too, would correct, so I waited until it was almost on me and then I rolled to the right and it went on by. It was awe inspiring … The truth is you never do get used to the SAM's; I had about two hundred fifty shot at me and the last one was as inspiring as the first. Sure I got cagey, and I was able to wait longer and longer, but I never got overconfident. I mean, if you're one or two seconds too slow, you've had the schnitzel."
>
> *— General Robin Olds, USAF*

SAM radars have a max range of 12 hexes. When activated a SAM site rolls to lock-on to a US flight. If locked-on, it must roll to maintain lock-on or launch a missile. If no flight is within range when it activates, it can turn its card over and roll to lock-on when a US flight comes within range. NB If a US flight is engaged in air-to-air combat with VPAF aircraft, the SAM site will lose lock-on Roll a D10:

Result/Target	Flight undetected	Flight detected	Already locked-on
Not Acquired	3+	6+	9+
Lock-on	1–2	1–5	1–8

+1	flight on deck
+1	flight making evasive manoeuvres
+1	flight is EA-6 or B-52G

+1	SAM site damaged
+2	SAM site badly damaged
–1	flight exceeded its free turn limit
–1	SAM radar within 2 hexes
–2	flight lacks ECM pod e.g. F-4C Wild Weasel, F-100F WW, F-105G WW, A-1

A roll of 10 (before DRMs) = SAM site locks on to a VPAF flight if there is one within an arc of 30 degrees either side of a line between the site and the US flight it is intending to lock-on to. If a lock-on is achieved on a VPAF flight, the site fires a missile next turn.

SA-2s have a minimum range of 2 hexes and a max range of 8 hexes. A SAM site that begins the turn with a lock-on to a US flight may fire a missile when it is activated. A US flight under SAM attack may choose to make evasive manoeuvres: move 1 hex in a random direction and lose an altitude level, jettisoning bombs if any carried.

Roll 2D6: Score 12 to hit, +1 if target has no ECM or did not evade. A roll of 2 means the SAM locks-on to the nearest flight (of either side) if there is one within the 60 degree arc of the site: roll again and hit on a 12.

From 1968 onwards US ECM is significantly improved and aircraft may make a saving roll with a D10. If hit, score 5 or more to convert the hit to an evade, 8 or more to convert it to a miss; if forced to evade, score 5 or more to convert evade to miss. B-52Gs +2 to die roll

A SAM hit destroys a helicopter. Fixed wing aircraft roll a D10:

1 = damaged, 2–3 = crippled, 4+ = shot down.

9. Ejecting

'It is generally inadvisable to eject directly over the area you just bombed.'

<p style="text-align:center">— USAF Manual</p>

Draw a card to eject: ♥ ♦ = eject ♣ ♠ = KIA. A K Q J ♥ = land a D10 hexes away (pilot's choice) as the pilot manages to keep the stricken plane airborne for a few minutes more. Otherwise place parachute marker in hex. Aircrew baling out from high or medium altitude take 10 turns to land, 2 turns at low and immediately if on the deck. Once on the ground, take a card for the success of the CSAR mission, unless crew bailed out over AAA site, SAM site or built-up area in which case they count ♥ as ♦ on table below.

♥	rescued by combat search & rescue team
♦	Captured by NVA forces: go to Hanoi Hilton[46]

♣	Captured by NVA if over Vietnam. If over Laos = executed.
♠	Executed out of hand or killed on arrival at POW facility

Alternatively, CSAR missions can be gamed. Helicopters, sometimes escorted by A-1s or A-7s attempt to rescue the aircrew. Up to two flights of aircraft from the raid can stay to cover the rescue, fuel permitting. The downed aircrew draw a card each turn

A♠ = killed by local militia; KQ♠ = captured by local militia: off to Hanoi Hilton. To affect rescue: land CSAR helicopter in aircrew's hex and draw a ♥ or ♦. If within 2 hexes of AAA, draw a ♥. Repeat attempts are allowed.

10. Anti-Radiation Missiles

ARMs can be fired at radar-directed AAA and SAM sites and have their radar switched on. USN Wild Weasels can launch them pre-emptively

Shrike: range 1 hex if launched from low, 2 if from medium/high. Can be lofted* to 5.

Standard-A: range 10 hexes, 15 if lofted*.

Standard-B: range 10, 15 lofted*.

*Aircraft conducting a lofting attack are not permitted to dive during the turn.

To hit: roll a D10 as for iron bombs.

+1 Standard-B

–2 lofted launch/under AAA fire

–3 Standard-B fired at a radar that shut down at launch

SAMs or radar-directed AAA roll a D10 when an ARM is fired from a detected US flight. 1 = radar stays on, 2+ player's choice to shut down. Standard-A and Shrike miss if the SAM radar shuts down. Draw 4 cards for Standard, 2 for Shrike to determine damage on the target. Shift 1 row upwards for Shrike.

11. Air-to-ground ordnance

Iron bombs

The bombing flight announces how many cards (= bombs) it will drop, then rolls 1 D10 for accuracy:

Score	Accuracy	Cards required to hit
1–4	Wild	♥
5–6	Scattered	♥♦
7–8	Accurate	♥♦♣

9+	Exceptional	♥♦♣♠

–1 bombing from medium altitude

–2 bombing from high altitude

–2 toss bombing or radar-directed bombing

–2 under AAA fire (ignore if the flight is undetected at the point it releases ordnance)

+1 dive bombing*

+2 pressing home a dive bombing attack**

*flight must be at low or on the deck and not climb during the turn. It does not have to change altitude level.

**end the turn on the deck and roll 2 D10s: 00 = 1 aircraft flies into the ground.

Pinpoint targets e.g. bridges shift up one row. Notably tricky pinpoint targets (e.g. the Paul Doumer bridge) shift up two rows.

If the adjusted score was less than 1, the bombing was so poor it strikes an adjacent hex (dice randomly).

If the target is a SAM site or AAA battery draw cards for damage immediately. Otherwise resolve damage when a BDA flight has observed the target. Double the number of cards if using cluster bombs on SAM site/AAA/vehicles or personnel. Half when using CBUs v. other targets.

1 hit to a SAM site or AAA battery causes it to be suppressed (= can't fire or use radar for the rest of this turn or next turn)

2 hits = damaged

3 hits = badly damaged

4 hits = destroyed

Laser-guided bombs

Must be at medium or lower altitude to attack. Roll for accuracy as above, but apply the following DRMs:

–1 attacking on the deck

–2 under AAA fire

Draw only 1 card. If it is the suit shown required to hit, the target is destroyed.

Electro-Optical Guided Bombs

As for LGBs but EOGB must be launched from medium or lower altitude and 1 or 2 hexes from target. Use the following DRMs:

–2 under AAA fire

–3 using Walleye II

–4 using Walleye I

12. Damaged aircraft

Damaged and crippled aircraft must jettison bombloads. Crippled aircraft reduce movement by 1 hex and cannot move at maximum speed.

13. BDA

To carry out a bomb damage assessment flight, and thus discover the result of a bombing mission, overfly the target with an RF-101, RF-4 or RF-5. Roll a D10 if the aircraft returns to base and score 10 or less to succeed if the photo mission was conducted on the deck, 9 or less if at low, 8 or less at medium and 7 or less at high. +1 to the score if damaged, +2 if crippled, –1 not fired at by AAA over target.

14. Getting home

Aircraft that are damaged or low on fuel may not make it home. Roll 2D10 and score 2 or more to recover safely. –2 if damaged, –7 if crippled, –3 per turn of afterburner used in excess of fuel limit, –2 rookie pilot.

USN aircrew ejecting over the water roll D10: 1 = captured, 2–3 = drowned, 5+ rescued.

USAF aircrew ejecting en route to Thailand roll D10: 1 = KIA, 2–4 eject over Laos, 5+ rescued.

If ejected over Laos roll again 1–6 = MIA to this day, 7+ rescued by Air America/indigenous mercenaries or Special Forces.

15. Bombloads

Bombloads (in cards per plane in the flight) are as follows.

Note that CBUs count double v. SAM or AAA sites or personnel but have no effect on hard targets.

USN F-4B, F-100F WW,F-105WW	1
F-105D/G, F-8, AH-1	2
F-4C/D/E, A-4, A-7	3
A-6	4
F-111, B-52G	6
B-52D	30

ARM loads are as follows per plane in flight

F-100F Wild Weasel   1 x Shrike

F-4C Wild Weasel/A-7/A-4/A-6   2 x Shrike

| F-105F Wild Weasel | 2 Shrike or 1 x Standard-A |
| F-105G Wild Weasel | 2 Shrike or 1 x Standard-B |

16. VPAF flights

For a randomly generated force, draw cards for each aircraft type and for dummies. The result is the number of flights. Flights comprise 2 aircraft except for MiG-17s which have four if a picture card is drawn.

Type	♥	♦	♣	♠
MiG-17	4	2	2	0
MiG-19	1	0	0	0
MiG-21	2	2	0	0
dummies	2	2	3	3

For a solo game, roll D10 for each flight once the US spot it, detect with F-4 radar or it engages: 1–3 = MiG-17, 4 = MiG-19, 5–6 = MiG-21, 7+ = dummy. Roll D10 for number of aircraft in MiG-17 flight. Use D6 for MiG-19/21: 1–2 = 1, 3–5 = 2, 6 = 3, 7+ = 4.

Roll a D10 for altitude the first time it matters: 1–3 = deck; 4–6 = low; 7–8 = medium; 9+ = high. +1 MiG-19, +2 MiG-21

For VPAF aircrew quality, draw a card the first time it matters: A=Ace, K = veteran, Q–7 = normal, 2–6 = rookie

Historical Notes

A typical USAF strike package:

Mission	Flights	aircraft per flight	Type
Iron Hand	2	2	F-105F WW
MIGCAP	1–2	4	F-4C
Strike Force	3–6	4	F-105/F-4
Recce	1	1	RF-101

A USN Alpha strike:

Mission	Flights	aircraft per flight	Type
Iron Hand	2	2	A-4 or A-7
Iron Hand Escort	2	2	F-8 or F-4
MIGCAP	2	2	F-8 or F-4
Strike Force	4	4	A-4, A-6 or A-7
Strike Force Escort	2	2	F-8 or F-4

Recce	1	1	RF-5

Iron Hand flights are equipped with a mixture of anti-radiation missiles and cluster bombs to engage SAM sites and AAA positions.

Bombloads (in cards per plane in the flight) are as follows. Cross of each card as expended

USN F-4B, F-100F WW,F-105WW	1
F-105D/G, F-8	2
F-4C/D/E, A-4, A-7	3
A-6	4
F-111, B-52G	6
B-52D	30

ARM loads are as follows per plane in flight

F-100F Wild Weasel   1 x Shrike

F-4C Wild Weasel/A-7/A-4/A-6   2 x Shrike

F-105F Wild Weasel   2 Shrike or 1 x Standard-A

F-105G Wild Weasel   2 Shrike or 1 x Standard-B

VPAF aircraft

Type   Entered Service   Notes

MiG-17F   April 1965

MiG-17PF   February 1966 All weather

MiG-19S   February 1969

MiG-21F-13   January 1966

MiG-21PF   April 1966 No cannon

MiG-21PFM   May 1968 All weather. No cannon

MiG-21MF   April 1969 All weather

"During four months of 1966, I briefed each day for missions into NVN with a group that typically consisted of four or five flights of four aircraft - a total of around 25 pilots at a time. On average over the period we lost one of those guys daily. Next morning, start with 25, that night you have 24. Go in the following day with 25, finish the day with 24. Over six months that it took to fly my 100 missions my roommate kept a diary that listed each time we lost someone. During the tour we lost 110% of the aircraft assigned and 60% of the pilots who started the 100 mission tour didn't finish.

"We always knew where we were, but occasionally did ignore it. I think I've previously

recounted the trip with my squadron commander, Fred Tracy (first F-105 MiG kill) in which we headed north of Dien Bien Phu to about 75 miles into China. His reason? 'I'll never get a second MiG if we don't go where they are.'"

Ed Rasimus Fighter Pilot (ret)

18: On a Wing and Prayer - Bomber Command in the Battle for the Ruhr, July 1943

"Stop the Allied bombing or we cannot win."

Field Marshal Rommel to the German High Command July 1944.

The bomber campaign against Germany is now one of the most contentious parts of the Second World War. Air Chief Marshal Sir Arthur Harris and the aircrew of RAF Bomber Command have been almost demonised for their part in the war against Nazi Germany; in particular for the wholesale destruction of German cities.

The effectiveness of the bombing campaign on the German war effort was staggering. It paralysed the transport system, hit oil production and area bombing of towns and cities caused chaos. There can be no better expert view to turn to than Albert Speer, the architect of German war production. It is worth quoting in full:

"The real importance of the air war consisted in the fact that it opened a Second Front long before the invasion of Europe. That front was in the skies over Germany. The fleets of bombers might appear at any time over any large German city or important factory. This front was gigantic. Every square metre of our territory became a front line. Defence against air attacks required the production of thousands of anti-aircraft guns, the stockpiling of tremendous quantities of ammunition all over the country and the holding in readiness of hundreds of thousands of soldiers, who had to stay in position by their guns, totally inactive, often for months at a time."[47]

Germany had to deploy 8,876 of the formidable 88mm flak guns for air defence of the homeland, 25,000 20 and 30mm flak guns, and 900,000 fit men to man these defences. The size of the effort can be illustrated by considering that facing the Allies in Normandy were just 500,000 German soldiers. The bombers' war was truly a second front.

This game is about the experience of the British bomber crews as part of the war, in particular raids on the Ruhr. The game was created by John Armatys, an innovative creator of detailed historical simulations. It is reproduced with permission,

1. **Background to *On A Wing and A Prayer*** by John Armatys

The game was inspired by a cheap 1:144 scale die-cast model of a Lancaster bomber, and was run at a number of shows by Wargame Developments Display Team (North) in the 2006/07 season.

A 1/144 scale Lancaster is attacked by by a Bf-110 night fighter (both Minicraft kits)

The model was of an aircraft from 106 Squadron flown by Guy Gibson, however three aeroplanes had carried the same code letters (ZN-Y), and so Gibson's 'Admiral Prune' became 'Y Yorker'. 106 Squadron had been stationed at RAF Syerston near Newark during the Battle of the Ruhr. Any Lancaster can be used for the game by substituting the appropriate letter, and, if you are particular, researching the aircraft's squadron and finding where it was based. The power of the internet has greatly simplified the latter task.

The only equipment needed apart from a Lancaster for each player is:

o   A black cloth to cover the table.

o   Ten tiles (thick card will do) to represent the key points on the operation: RAF Syerston, Over the North Sea, Enemy Coast Ahead, Kammhuber Line, Over Germany, Flak Zone, Over the Target, Over Germany, Kammhuber Line, North Sea. Suitable illustrations for the tiles can be found on the Internet. The tiles are laid on the table in order to form a circular route, starting and ending at RAF Syerston.

o   One Me110 and one Ju88 model (1:300 scale, these can be simply painted black).

o   A set of letter tiles to represent the aircraft on the operation, one of each letter of the alphabet except I and O, with a rack to put them on. The tiles were taken from a *Form a Word* game, a small version of *Scrabble*. Alternatively, letters on small pieces of card will suffice.

o   The turn counter, showing the following basic details for each turn:

   Turn 1 - RAF Syerston - Take off

   Turn 2 - Over the North Sea - test guns

   Turn 3 - Enemy Coast Ahead

   Turn 4 - Kammhuber Line

   Turn 5 - Over Germany

   Turn 6 - Flak Zone - Searchlights and Flak

   Turn 7 - Over the Target "Green Markers ahead, Skipper!"

   Turn 8 - Over Germany

Turn 9 - Kammhuber Line

Turn 10 - North Sea

Turn 11 - RAF Syerston - Landing

o   A few six sided normal dice (D6).

o   A Velcro dart board with a sticky ball to throw at it. *Alternatively*, a piece of card approximately 30 cm in diameter with a circle approximately 10 cm in the centre. The bomb attack is throwing a single 2p coin (a medium sized coin) from approximately a metre away. A hit within the inner circle is dead on the centre of the factory; within the larger circle are hits on other buildings in the complex.

o   A peg board or similar to record if the aircraft is off track (and therefore out of the bomber stream) and any damage suffered.

Photo of an Avro Lancaster of No. 1 Group, Bomber Command, silhouetted against flares, smoke and explosions during the attack on Hamburg, Germany, by aircraft of Nos. 1, 5 and 8 Groups on the night of 30/31 January 1943. This raid was the first occasion on which H2S centimetric radar was used by the Pathfinder aircraft to navigate the force to the target. The pilot of the photographing aircraft (Lancaster 'ZN-Y' of No. 106 Squadron, based at Syerston) was Flt Lt D J Shannon who, as a member of No. 617 Squadron, took part in Operation CHASTISE (the "Dams Raid") during the following May. Source of photo and description, Wikimedia, the Commons.

2. **The Game**

Game set up

The player is given a hand-out (see Appendix 1) with some information about the

Lancaster, recognition silhouettes of German night fighters, the 1943 phonetic alphabet and a list of Lancaster crew positions, and is asked to write his or her own name in a position of their choice. The umpire explains that the crew would have formed in an OTU (Operational Training Unit), and asks the player to write the names of friends and acquaintances (but not relatives - one of the videos had a veteran saying, "I lost a lot of friends, but it wasn't like losing a relative.") into the other crew positions.

The player is told that their Lancaster is Y Yorker from 106 Squadron of 5 Group, Bomber Command, based at Royal Air Force Syerston, five miles south west of Newark, Nottinghamshire. The squadron has 17 aircraft on charge (16 plus a spare).

The player or umpire rolls a D6 - The number of aircraft on the operation is 16-1D6. Letter tiles are drawn and put on a rack to show which aircraft from 106 Squadron are on the mission (always include Y Yorker).

Briefing

The player is told that the game is set in the Battle of the Ruhr, which ran from March to July 1943 - "Your target for tonight is Essen (in the 'Happy Valley'). Pathfinders will mark the target; all you have to do is bomb on the target indicators."

Playing The Game

Each turn the Lancaster is moved onto a different tile decorated with a suitable picture and laid out on the table forming a loop beginning and ending at RAF Syerston.

If at any stage the Lancaster is shot down the crew will try to bale out. Aircrew had a 19% chance of surviving being shot down in a Lancaster.

Roll 2D6 for each crew member, -2 if wounded, -1 if over the target:

   12   Land safely, evade the Germans, get back home months later via a neutral country.

   11 – 9 Land safely, captured, end the war in *Stalag Luft* 3.

   8 - 3 Didn't make it.

   2   Land safely, killed by irate Germans.

Turn 1 - RAF Syerston - Take off

Roll 2D6:

   2 - 9 All OK.

   10   Narrowly miss another bomber whilst taxiing.

   11   One of the squadron suffers engine failure after take-off - roll dice to see which aircraft returns to base. This does not count as an operation for the crew.

   12   One of the squadron has a tyre blow out - roll die to see which aircraft runs off the runway on 1D6 = 5 or 6, otherwise it aborts take off and in any event is out of the game.

Turn 2 - Over the North Sea - test guns

Roll 2D6:

  2 - 9 Guns work OK.

  10   Y's Navigator can't get a fix on GEE. Roll 2D6, 2-5 drift left, 9-12 drift right. (The player is told next turn that Y Yorker has left the bomber stream unless GEE continues to play up).

  11   One of the squadron has an engine overheat - roll die to see which aircraft returns to base on 1D6 = 5 or 6.

  12   One of the squadron's pilots suffers stomach ache - roll die to see which aircraft returns to base on D6 = 6 unless the player is the pilot.

Turn 3 - Enemy Coast Ahead

Roll 2D6:

  2   Coned by searchlights (Y Yorker if not in bomber stream, otherwise throw dice to see which aircraft in the squadron is attacked), the aircraft may dive out of way (succeed on 2D6 score of 8+), otherwise it is hit by flak - roll 2D6, hit on 8 or 9 (minor damage), 10 (lose an engine, drop bombs - the Lancaster can fly on three engines in the bomber stream, but can't keep in the bomber stream on two engines), 11 (crewman wounded, roll to see which) or 12 (shot down).

  3 – 10 OK.

  11   Y Yorker has a Monica alarm. Monica is a radar system that tells you when something is on your tail: Choices are ignore it or corkscrew left or right –

  If corkscrew left or right put aircraft off track in that direction. (The player is told next turn that Y Yorker has left the bomber stream unless GEE is playing up).

  The Monica alarm is a real attack on a roll of 1 or 2, false alarm on a roll of 3-6 on a D6. If a real attack and aircraft corkscrewed, night- fighter lost, if a real attack and the aircraft did not corkscrew, see night-fighter attack below.

  12 Night-fighter attack, chose a Ju88 or Me110 night fighter at random. Y Yorker is the target if not in the bomber stream, otherwise throw dice to see which aircraft in the squadron is attacked - roll 2D6, if 10, 11 or 12 shot down without seeing anything, otherwise the aircraft may corkscrew left or right (putting it off track) and/or fire guns (hit target on 12, puts enemy off on 9, 10 or 11). If German is not put off he fires again needing 8+ to hit, then Lancaster replies, and so on….).

Turn 4 - Kammhuber Line

The Kammhuber Line was an extensive network of searchlights, radar and night-fighters based in occupied France, Belgium and Holland, covering the approaches that British bombers took to reach their targets. Roll 2D6:

  2 - 8 OK

9 – 10 Night-fighter attacks (as turn 3 above).

11 Y Yorker has a Monica false alarm (as turn 3 above).

12 Y Yorker's Navigator can't get a fix on GEE (as turn 2 above).

Turn 5 - Over Germany

Roll 2D6:

2 - 6 Nothing happens.

7 - 9 Night-fighter attacks (as turn 3 above).

10 Drift over flak zone, hit by flak (as turn 3 above).

11 Y Yorker has a Monica false alarm (as turn 3 above).

12 Y Yorker's Navigator can't get a fix on GEE (as turn 2 above).

Turn 6 - Flak Zone - Searchlights and Flak

Roll 2D6:

2   OK

3   Y Yorker is buffeted by flak, roll 2D6 again:

4   Friendly aircraft seen to go down in flames.

5   See a scarecrow shell (actually a Lancaster exploding after a direct hit).

6 - 8   Nothing worse happens.

9 -10 Coned by searchlights (as turn 3 above).

11-12 Hit by flak (as turn 3 above).

Turn 7 - Over the Target "Green Markers ahead Skipper!"

Roll 2D6:

2 - 7 OK

8 - 9 Y Yorker is coned by searchlights (as turn 3 above).

10 -11 Y Yorker is hit by flak (as turn 3 above).

12 Roll again:

2 – 6   Collide with another bomber - 1D6 damage.

7   Your lucky day - a near miss.

8 – 12 Hit by bomb from a higher aircraft - 1D6 damage.

The bombing sequence is then run, using the high quality bombing simulator (a Velcro dart board placed on the table and a sticky ball or the 2p thrown onto the card target). The player should stand and should throw the ball at the dart board after the umpire announces,

"Bomb doors open." If the player's hand goes over the table Y Yorker will be hit by flak (see above). Training at OTUs is to stand well back from the table and throw under arm. The player must say, "Bombs gone!" at the appropriate time.

Turn 8 - Over Germany

Roll 2D6:

2 - 8 Night-fighter attacks (as turn 3 above).

9 – 10 Drift over flak zone, hit by flak (as turn 3 above).

11 Y Yorker has a Monica false alarm (as turn 3 above).

12 Y Yorker's Navigator can't get a fix on GEE (as turn 2 above).

Turn 9 - Kammhuber Line

Roll 2D6:

2 - 8 OK.

9 – 10 Night fighter attacks (as turn 3 above).

11 Y Yorker has a Monica false alarm (as turn 3 above).

12 Y Yorker's Navigator can't get a fix on GEE (as turn 2 above).

Turn 10 - North Sea

Roll 2D6, add 1 for each point of damage and 1 for each engine lost:

2 – 12 OK.

13+ Ditch - The pilot lowers flaps to 25°, turns into final approach position according to state of sea, switches on the landing lamp if ditching at night, warns the crew, "Brace for Ditching!" and disconnects the intercom. There will be two shocks as the aircraft ditches. First will be a milder shock as the tail hits the water; this will be followed by a more violent shock as the front hits. Once the aircraft has settled commence evacuation to dinghy. Try to keep as dry as possible and avoid jumping into the sea. In winter, survival time in the sea can be as little as four minutes. An air sea rescue launch picks up the crew after an unpleasant few hours.

Turn 11 - RAF Syerston - Landing

Roll 2D6:

2 - 4 Fogged in - divert - take this turn again.

5 – 11 Land safely.

12 German night-fighter - roll 2D6, 11 or 12 and Y Yorker is shot down without seeing anything.

3. Interrogation

On landing the crew are taken to the intelligence hut, given enamel mugs of cocoa and asked a series of questions:

1) What happened on the operation?

2) If appropriate, what type of aircraft were the night fighters?

3) What colour were the target indicators you bombed on?

The target photo (= the dart board/ circle with coin) is examined to see how accurate the bombing was.

The interrogation is the key point in the game - players are surprised how little they can remember, a good proportion will claim to have bombed red or yellow target indicators.

As a finale the player is told:

Essen was bombed six times during the Battle of the Ruhr, Bomber Command flew 3,261 sorties over the town with the loss of 138 aircraft (4.2%).

By the end of July 1943 the huge Krupps works covering several hundred acres in the centre of the city and the town of Essen itself contained large areas of devastation. Production of locomotives, large shells and fuses, had ceased altogether. Output of guns halved, and the production of aero-engine crankshafts was seriously reduced.

Back to the mess for sausage and mash or, if they are obtainable, bacon and eggs.

Mention is made of any empty tables in the mess.

The chances of surviving a 6 to 12 month tour of 30 operations was roughly 50%, after which aircrew were given a 6 to 12 month non-operational posting, to be followed by a second 20 mission operational tour. A third tour was voluntary.

Finally, players should be awarded a medal. The hand-out has more information on the damage caused to Essen and details of Bomber Command's casualties during the war.

Control tower of RAF Syerston (2006) taken by 'MilborneOne'

Appendix 1 - The Hand-out

Lancaster recognition silhouette

LANCASTER I

Dimensions: Wingspan: 102 feet, Length: 69 feet 4 inches, Height: 19 feet 7 inches

Weights: Unladen: 36,900lbs

Laden: 68,000lbs

Bomb load: 14,000lbs

Performance: Maximum Speed 287 mph, Cruising Speed 210 mph, Climbing Rate: 20,000 feet in 41 minutes, Ceiling: 24,500　　　　 feet, Range: 1,660 miles

Armament: Nose Turret: Twin .303

Mid Upper Turret: Twin .303

Rear Turret: 4 x .303

Gee Radio beacons in England used to fix position of aircraft. Accurate to within four miles.

Monica Tail-mounted radar to warn of night fighters.

Your Lancaster is Y Yorker from 106 Squadron of 5 Group, Bomber Command, based at Royal Air Force Syerston, five miles south west of Newark. The crew are:

Pilot……………………………..

Flight Engineer……………………………..

Bomb Aimer……………………………..

Navigator……………………………..

Wireless Operator……………………………..

Mid Upper Gunner…………………………..

Rear Gunner…………………………..

From 1941 until June 1944 nearly all raids carried out by the heavy bomber force of RAF Bomber Command were at night. Each aircraft flew on its own and without navigation lights. Avoiding collision was largely a matter of look out and luck. The pilot was normally in command of the aircraft and the crew was responsible to him for finding the target and bombing it, although on many occasions the Pathfinder Force would mark the target area and direct the general bombing tactics.

Up to early 1943 the accuracy of bombing was such that only between 22% and 32% of photos plotted showed that bombs had been dropped within three miles of the aiming point, however later in the war this figure increased to 90%.

Your target for tonight is Essen…. Bomb on the target indicators….

1943 Phonetic Alphabet *Unofficial alternatives are shown in brackets. I and O were not used for aircraft codes.*

JUNKERS Ju 88A6   MESSERSCHMITT Me 110
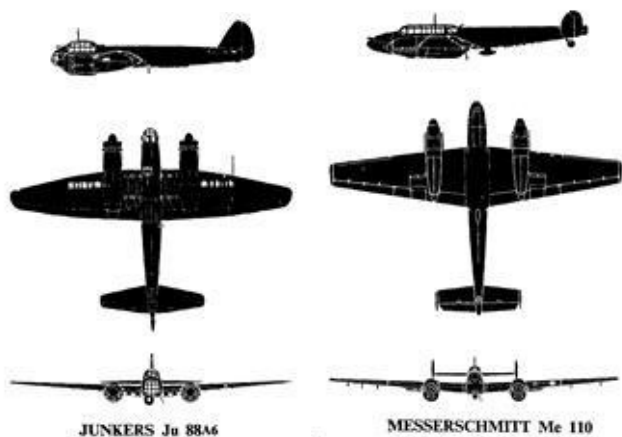
A   Ack (Apple)

B   Beer

C   Cork

D   Don

E   Eddy (Easy)

F   Freddie

G   George

H   Harry

I   Ink (Isaac)

J   Jug

K   King

L   London

M   Monkey (Mother)

N   Nuts (Nanny)

O   Orange

P   Pip (Peter, Popsie)

Q   Quad (Queenie)

R	Robert (Roger)
S	Sugar
T	Tock (Tommy)
U	Uncle
V	Vick
W	William
X	X-Ray
Y	Yorker (Yoke, York)
Z	Zebra

Historical Postscript

Essen was bombed six times during the Battle of the Ruhr, on 5/6 March 1943, 12/13 March 1943, 3/4 April 1943, 30 April/1 May 1943, 27/28 May 1943 and 25/26 July 1943. Bomber Command flew 3,261 sorties with the loss of 138 aircraft (4.2%).

After the raid of 12 March an Essen newspaper reported: "The extent of the damage caused by the raid, the heaviest yet suffered by a German town, cannot yet be ascertained. Across the ruins and the debris one has a wide view of the space formerly occupied by buildings, and the streets and squares present an amazing sight. They are changed to such an extent that one has to rely on memory to recall what they used to look like."

By the end of July both the huge Krupps works covering several hundred acres in the centre of the city and the town of Essen itself contained large areas of devastation. There was also serious damage to gas, water and electricity facilities. After the attacks, although repairs were pushed forward vigorously, some factories never resumed production. Among them was the largest single unit in the Krupps works, the Hindenburg Hall where locomotive construction ceased and was never restarted, despite this work the having equal priority with aircraft, tanks and submarines. Production of large shells, previously made at the rate of 400 per month, and fuses, previously 200,000 per month, ceased altogether. Output of guns halved, and the production of aero-engine crankshafts was seriously reduced.

Goebbels wrote in his diary on 28 July, "The last raid on Essen caused a complete stoppage of production in the Krupps works. Speer is much concerned and worried."

Bomber Command Casualties in World War II

Killed in Action	47,268	
Killed in flying or ground accidents)	8,195	
Killed in ground action	37	
Total killed		55,500
Wounded in aircraft returning from operations	4,200	
Wounded in ground or flying accidents	4,203	
Total Wounded		8,403
POW		9,838
Total aircrew casualties		73,741

8,375 aircraft were lost in action

19: Research: Books and Other Aids

This chapter has been updated in the light of the many publications now available since the book was first published in 1966. It is a very select bibliography.

There are many guides to the aircraft used in war, perhaps starting with the Jane's company series e.g. *Jane's Fighting Aircraft of World War I, Jane's Fighting Aircraft of World War II* etc… There are many others series e.g. *Allied Fighters 1939-45 (The Essential Aircraft Identification Guide),* the Osprey Combat Aircraft series,

The Air Force Historical Branch has produced many comprehensive guides to various campaigns including:

The RAF in the Bombing Offensive against Germany (in 7 Volumes)

The Air Defence of Great Britain (in 6 Volumes)

The RAF in Maritime War (in 8 Volumes)

The Campaign in Norway – April-June 1940

The Campaign in France & The Low Countries – September 1939-June 1940

The Liberation of North West Europe (in 5 Volumes)

Special Duties Operations in Europe

The Middle East Campaigns (in 10 Volumes)

The North Africa Campaign - November 1942- May 1943

The Sicilian Campaign (including Pantellaria & Lampedusa) June-August 1943

The Italian Campaign 1943-1945 (in 2 volumes)

Operations in the Dodecanese Islands

The Campaign in Southern France

The Campaigns in the Far East (in 6 Volumes)

The Malayan Emergency 1948-1960

See http://www.raf.mod.uk/ahb/publications/

The American Airforce Historical Branch is the American equivalent of the British one. See http://www.afhra.af.mil/ . This site includes a guide to airforce literature 1943-83 as a pdf download.

Air Wargaming

In addition to this work, there has only been one other book on air wargaming Mick Spick (1978) *Air Battles in Miniature A wargamer's guide to Aerial Combat 1939-1945.*

For assorted aircraft decals see www.domsdecals.com/

Fletcher Pratt Naval Wargame

For further detail about this game from 1943, see *Fletcher Pratt's Naval Wargame* edited by John Curry.

Commercial Board Games

For further information on board games about air warfare, the reader should start by looking at the Web Grognards and Board Game Geek web sites. These are http://grognard.com/titlef.html and http://boardgamegeek.com respectively.

Decision Games, publishers of *Strategy and Tactics Magazine,* can be found at www.decisiongames.com.

World War I

The Air Force Historical Branch *The Royal Air Force in the Great War*.

Peter Kiduff (1994) *The Red Baron* The Red Baron has generated a huge amount of literature. This particular book has been printed many times since first publication.

Cecil Lewis (2009) *Sagittarius Rising* Fine memoir from World War I.

World War II

Alan Deere (1959) *Nine Lives* Deere was in action 1939-43. One of many classic fighter pilot books.

Lee Deighton (2008 pb) *Fighter: the True Story of the Battle of Britain* A fine analysis of the Battle of Britain

Arthur Harris (1979) *Bomber Offensive by Marshal of the RAF Sir Arthur Harris* A rationale of the bomber offensive against Germany

Heinz Knoke (1953) *I flew for the Fuhrer* An account from the German perspective.

Gavin Lyall (1968) *The War in the Air 1939-45 an anthology of personal experience* A selection from a huge range of personal memoirs

Martin Middlebrook (1988) *The Berlin Raids: RAF Bomber Command Winter 1943-44*

Martin Middlebrook (1982) *The Peenemünde Raid 17-18 August* a compelling account of a particularly hazardous raid against the German V1 programme

Christopher Shores (1999) *Duel for the Sky: Ten Crucial Air Battles of World War II Vividly Recreated* This author has written many interesting books on air combat during World War II.

John Wellham (1985) *With Naval Wings : the autobiography of a Fleet Air Arm Pilot in World War II*

Sturmstaffel- Defending the Reich 1944

Luftwaffe Sturmgruppen, J Weald, Osprey 2005

The Mighty Eighth - a history of the US 8th Air Force, RA Freeman, Macdonald, 1970

100th Bomb Group website, www.100thbg.com

 On a Wing and Prayer: Battle for the Ruhr, 1943

Aspects of The British and American Strategic Air Offensive against Germany 1939 to 1945. An assessment of RAF Bomber Command and USAAF Casualties and Losses in World War II, Michael G. Varley, online at http://homepage.ntlworld.com/r_m_g.varley/

Bob Baxter's BOMBER COMMAND, online at http://www.bomber-command.info/

Bomber Offensive, Sir Arthur Harris, Greenhill Books, 1998

Britain's Wonderful Airforce Air Commodore P. F. M. Fellowes DSO, Odhams Press, c1943

Lancaster, 1983 (video), Leisureview Ltd. DD 242

New Zealanders with the Royal Air Force (Vol. II) *Chapter 3*: *Bomber Command and the Battle of the Ruhr*, online at New Zealand Electronic Text Centre, http://www.nzetc.org/tm/scholarly/tei-WH2-2RAF-c3.html

On a Wing and a Prayer, 1992 (video), Classic Pictures, VVD 1122

The Story of the Lancaster, 2006 (video) Castle Communications, CVB 1122

Target for Tonight, Lancaster Bombers Against Germany, D. W. Thomas, self-published hand-out for a game presented at the Conference of Wargamers, 2000

Right of the Line, John Terraine, Wordsworth 1997

Royal Air Force Bomber Command 60th Anniversary, online at http://www.raf.mod.uk/bombercommand/ (this link could not be found December 2011)

Vietnam War

Marshall L. Michel III (2007) *Clashes*: *Air Combat Over North Vietnam, 1965-1972 (air-to-air combat and doctrine, USAF and USN)* is a clear analysis of how the USAF tactics were initially wrong and how they learnt from the USN.

Marshall L. Michel III (2001) *The Eleven Days of Christmas: America's Last Vietnam Battle (the Linebacker II campaign)* is a brilliant book about American Command's approach to the North Vietnam air campaign.

Ed Rasimus (2004) *When Thunder Rolled* about his first tour as an F-105 pilot in 1965 is a very good autobiography

Ed Rasimus (2007) *Palace Cobra: A Fighter Pilot in the Vietnam Air War* is about his second tour as a F-4 pilot on Wild Weasel missions in 1972. A fascinating book, with many insights, for example USAF personnel policies: no one was forced to do a second tour until everyone with wings had flown a tour in Vietnam - which meant for instance that someone who had spent his whole career flying transports stateside could be assigned to Phantoms over North Vietnam.

Cold War

William Burrows (2003) *By Any Means Necessary, America's Secret Air War*. The account of secret reconnaissance during the Cold War.

James F. Dunnigan |(multiple editions) *How to Make War a comprehensive guide to modern warfare* A good analysis of modern air operations.

Alfred Price (1986) *Air Battle Central Europe* A rare account of the potential air battle that would have been fought if NATO and the Warsaw Pact turned to war.

Robert L Shaw (1985) *Fighter Combat: Tactics and Manoeuvring*.

Phillip Jarrett (ed.) (2000) *The Modern War Machine - military aviation since 1945*. Putnam History of Aircraft series.

P.V.S. Jagan Mohan & Samir Chopra (2006) *Manohar The India-Pakistan Air War of 1965*.

Sharkey Ward (2000) *Sea Harrier Over the Falklands*

Gulf War

[Richard T. Reynolds, Colonel](#) USAF (2005) *Heart of the Storm: The Genesis of the Air Campaign against Iraq*

20: Last-minute Thoughts!

These last-minute additions are included with some trepidation, as they might possibly be considered to possess certain 'off-beat' characteristics!

The dramatic effects of wargames, whether they be on land or sea or in the air, might well be enhanced by a background of suitable sounds and noises.

The original edition then went on to list various records with sound effects that can be used to enhance games. Now there is a large number of sites with royalty-free sound effects, starting with http://www.freesound.org/browse/. The latter has a large number of sound effects suitable to enhance any wargame with appropriate sound effects.

Next we deal with some possibly unique methods of simulating real-life occurrences connected with air warfare. Previous chapters have described how the model aircraft are manoeuvred over the table-top battlefields as they carry out the specific operations for which they are designed. This will include, amongst others, artillery observations, photo reconnaissance and bombing. Let us consider them:

a)   *Artillery Observation*. This is self-explanatory but a realistic 'gimmick' is to have the aircraft trailing a W/T aerial so that information is sent directly to artillery commands for immediate fire missions.

b)   *Photo Reconnaissance*. These are long-term missions designed to discover enemy locations and to detect possible moves. Both sides will require maps of the battlefield and will mark the areas 'over-flown'. If the aircraft returns safely to its base the photos will be considered processed and evaluated after a specified interval. Then the force which has been over-flown will pass to the other side a note of composition and strength of the units and locations that have been photographed. This information will only cover the situation as it was at the time it was photographed and will not indicate changes which have occurred between then and when the photos are ready. The information should include troop movements, build-ups prior to attacks and shifts of men and material to reinforce parts of the line in anticipation of attacks.

c)   *Bombers.* Again, self-explanatory. Bomb-pattern may be assessed either by dropping the bombs directly from the aircraft or by use of wire trajectory curves. The former is by far the simplest to judge, although the actual implementation is not always realistic. The wire trajectory curves can be made of springy piano-wire of suitable length; it is stretched from the aircraft to the target in a realistic curve and indicates where the bomb actually fell.

Ground-fire (anti-aircraft artillery) has been considered in various parts of this book, possibly not as comprehensively as might be desired, but it represents a difficult factor to simulate on the wargames table. The actual weapons themselves can be obtained. One can buy a plastic 105mm German howitzer out now that would, with a little work, make a most useful AA gun - but only for the Germans. Any World War I-type artillery piece could be used, however, with a little disguising through a ground base and added seats,

etc. Machine guns would be easy, just taking the standard 20mm infantry models and mounting them on AA swivels.

Soviet Air Assault making an opposed landing on an airfield in northern Japan during a fictional World War 3 campaign. The Antonov AN-26s are 1/288 plastic kits. The white crosses indicate damage on the vehicles. Photo taken by Tim Gow.

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[1] Murray Fletcher Pratt (1897–1956), an American writer and author of a set of rules for naval wargaming before the Second World War. The Fletcher Pratt Naval War Game involved a large number of wooden model ships, to a scale of one inch to 50 feet, whose manoeuvres were calculated by mathematical formulae.

[2] John Fredrick Thomas Jane (August 6, 1865 – March 8, 1916) was the founding editor of the famous reference books on warships and author of a set of naval wargame rules. See *Fred T Jane an Eccentric Visionary* by Richard Brooks, 1997.

[3] Paraphrasing H.G. Wells in *Little Wars: A Game for Boys from twelve years of age to one hundred and fifty and for that more intelligent sort of girls who like boys' games and books*; see *The Early Wargaming Pioneers* (2011) by John Curry.

[4] The game Stevenson devised and played with his stepson, Lloyd Osbourne, was described by the latter in *Stevenson at Play*, Scribner's Magazine, December 1898. It has been republished in *The Early Wargaming Pioneers* (2011) by John Curry.

[5] *Little Wars* was originally published by F. Palmer, London, 1913.

[6] A character in a short story by the American writer James Thurber, who escapes from the humdrum reality of his suburban life and nagging spouse by daydreaming or fantasising about himself performing heroic deeds in battle.

[7] Manfred Albrecht *Freiherr* von Richthofen (2 May 1892 – 21 April 1918), known as the Red Baron, was a German fighter pilot with the Imperial German Army Air Service in World War I. He was officially credited with eighty air combat victories, more than any other pilot.

[8] Max Immelmann (21 September 1890 – 18 June 1916) was the first German World War I flying ace. The Immelmann turn, a manoeuvre used after an attack on another aircraft to reposition the attacking aircraft to dive back down to attack again, is named after him.

[9] *The War in the Air,* Pall Mall Magazine, 1908; available online at Project Gutenberg, http://www.gutenberg.org/ebooks/780. In the original edition, reference was made to Wells's *The War of the Worlds,* but that novel describes a Martian invasion of Edwardian England, rather than the combats between airships, ornithopters and gliders, described in the former, to which the author was surely referring.

[10] New edition printed by the History of Wargaming Project in 2008.

[11] *Naval War Games,* Stanley Paul, London, 1965; republished in the History of Wargaming Project.

[12] Izaak Walton (9 August 1593 – 15 December 1683), an English writer best known as the author of *The Compleat Angler.* The title of *Featherstone's Complete Wargaming,* David & Charles, 1989, is an oblique reference to Walton's book.

[13] 10p in UK decimal currency. Today, such kits retail for c.£6.00!

[14] The rules of veteran wargamer Archie Cass were the original Society of Ancients set and first appeared in printed form in 1965. They were distributed through the SoA and were superseded by Tony Bath's rules, which in turn gave way to those of WRG.

[15] Period when storms do not occur.

[16] The Aurora Plastics Corporation was a U.S. toy and hobby manufacturing and marketing company, known primarily for its production of plastic model kits in the 1960's.

[17] Anti-aircraft fire; from the German acronym for an anti-aircraft gun, derived from fl(ieger) a(bwehr) k(anone).

[18] The generic formulation of the brand name, Plexiglas, for a transparent, synthetic polymer used as an alternative to glass.

[19] See the *Fletcher Pratt Naval Wargame,* in the History of Wargaming Project

[20] Observation balloons were also used briefly by the French in the Revolutionary War. At the Battle of Fleurus (26 June 1794) Colonel Jean-Marie-Joseph Coutelle's balloon *L'Entreprenant* was tethered high above the battlefield so the crew could pass down reports of the position of enemy troops.

[21] On October 7, 1870, the minister of the new French government, Léon Gambetta, made a dramatic escape from Paris by balloon, and with his chief assistant, Charles Louis de Saulces de Freycinet, established a provisional capital in the city of Tours.

[22] See the *Fred Jane Naval Wargame (1906),* printed by the History of Wargaming Project

[23] Albert Ball VC, DSO & Two Bars, MC (14 August 1896 – 7 May 1917), fourth highest scoring English fighter ace of the First World War with 44 victories.

[24] James Thomas Byford McCudden VC, DSO & Bar, MC & Bar, MM (28 March 1895 – 9 July 1918), an English fighter ace credited with 57 victories. McCudden rose through the RFC ranks (from Air Mechanic to Major) during the war to become the third highest scoring British ace of World War I.

[25] A 1930 aviation melodrama by eccentric millionaire Howard Hughes, who piloted one of the planes himself; it is said that three pilots were killed making the film. Also notable for a sultry appearance by eighteen year old Jean Harlow.

[26] William Avery "Billy" Bishop VC, CB, DSO & Bar, MC, DFC, ED (8 February 1894 – 11 September 1956), the top Canadian First World War flying ace, officially credited with 72 victories, and according to some sources, the top ace of the British Empire.

[27] Gervais Raoul Lufbery (March 14, 1885 – May 19, 1918), a French-American fighter pilot and flying ace in World War I. He served in both French aviation, and later the United States Army Air Service in World War I, though all but one of his 17 official combat victories came while flying in French units.

[28] Edward 'Eddie' Vernon Rickenbacker (October 8, 1890 – July 27, 1973), highest scoring American fighter ace in World War I, credited with 26 victories, and Medal of Honor recipient.

[29] French: a small (and usually shabby) cafe selling wine and beer and coffee.

[30] A reference to Chateaubriand steak, a luxury dish named after the French statesman François Auguste René, the vicomte de Chateaubriand.

[31] Frank Luke Jr. (May 19, 1897–September 29, 1918), an American fighter ace, ranking second among U.S. Army Air Service pilots with 18 victories – 14 balloons and 4 aircraft - and the first airman to receive the Medal of Honor.

[32] Willy Omer Francois Jean Coppens (6 July 1892 – 21 December 1986), Belgium's leading fighter ace and the champion 'balloon buster' of World War I, credited with destroying 34 observation balloons and 3 aircraft between April and October 1918.

[33] Heinrich Gontermann (25 February 1896 – 30 or 31 October 1917), a German First World War fighter ace credited with 39 victories – 21 aircraft and 18 balloons.

[34] *The Longest Day: The D-Day Story, June 6th, 1944* by Cornelius Ryan, Tauris Parke Paperbacks, 2010. Ryan was one of the screenwriters for the film version in 1962.

[35] Heinz-Wolfgang Schnaufer (16 February 1922 – 15 July 1950), German *Luftwaffe* night fighter pilot and highest scoring night fighter ace in the history of aerial warfare. His 121 aerial victories were claimed during World War II at night, mostly against British four-engine bombers. [He was nicknamed 'The Night Ghost of St. Trond'.

[36] Trevor Nevitt Dupuy (May 3, 1916 – June 5, 1995) was a Colonel, United States Army, retired, soldier and noted military historian. Dupuy's main contribution to military operation analysis is the *Quantified Judgment Method* or *QJM,* where the outcome of a battle is predicted using a complicated formula in which various factors relating to the strength and fire power of the fighting parties as well as the circumstances are taken into account. Dupuy and his associates adjusted the parameters of his model by using known statistical facts of several recorded battles.

[37] THEATERSPIEL 3 was a theatre-level wargame developed by the Research Analysis Corporation for the study of Army problems. See *Computer-Aided Information Systems for Gaming* at http://www.dtic.mil/cgi-bin/GetTRDoc?AD=AD623091

[38] JANUS, developed in the 1970's and used at the Lawrence Livermore National Laboratory in Livermore, California, used to test how various weapons work and how use of a particular weapon might affect the outcome of a battle scenario.

[39] Or water-soluble or dry-wipe marker pen.

[40] See *Joseph Morschauser's How to Play War Games in Miniature, a forgotten Wargaming Pioneer, Early Wargames Vol 3* (2010) edited by John Curry and Bob Cordery

[41] First World War slang for anti-aircraft fire.

[42] The Avalon Hill Game Company was started in 1954 by Charles S. Roberts for the publication of his game *Tactics*, the first commercial wargame. The name was later changed to Avalon Hill in 1958, the name kept by the company until it folded in 1998. It is now owned by Hasbro, who have released new titles under the Avalon Hill name, and also added the name to games such as *Axis and Allies.*

[43] A *Gruppe* was roughly equivalent to an RAF Wing or USAAF Group

[44] D6 = 6 sided die

[45] Of the 1,394 airmen who were shot down over North Vietnam, 48% returned alive. Of the 1,290 shot over Laos, 60.3% returned alive (plus 9 released by Operation Homecoming in 1973). If pilots were seen to eject or could activate their small radio beacon, then the extraordinary efforts of the search and rescue teams were very successful. The chance of ejected pilots surviving long in the harsh mountainous jungles of Laos was almost zero. If they were injured prior to or during ejection, the chance would be zero. See Bruce Franklin *Mythmaking in America How and Why Belief in live POWs has gripped a nation*.

[46] I.e. prison.

[47] Albert Speer (1976) *Spandau, the Secret Diaries*