#8 S&T Supplement

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FIRST CLASS MAIL

Airpower in Miniatures

by Jay Richardson

Considering the impact airpower has had on modern warfare in the last few decades, I feel that it has been unjustly ignored in rules for miniature warfare games. So, in an effort to right this wrong, I present the following rules for the incorporation of ground-support aircraft into World War II battles.

The rules system on which these airpower rules are based is the one in the booklet FAST RULES, which contains rules for WWII wargaming with 20mm armor, artillery and infantry. For further information on this booklet, see the reference section at the end of this article.

I dare say that many readers will not have the FAST RULES booklet, and that a few more will not use the 20mm miniatures. This is not a major worry, as very few people engage in miniatures without realizing that they will make many rule changes and variations. There will, therefore, be very few miniatures players who cannot adapt these rules to their particular rules systems.

A few rules will not change from system to system and these will be noted as we go along.

2. SELECTION OF AIRCRAFT

For a ground-support role we will want three different types of aircraft: the fighter, the dive-bomber and the attack bomber. The attack bomber is any two-engine bomber equipped with bomb bays.

Planes may be represented either by models or cardboard replicas. Since it will take a long time to get enough suitable models for a battle, you will have to use the replicas to begin with.

As far as models are concerned, their scale should be equal to or <u>less than</u> that of your men. The planes themselves do not need to be matching in scale to each other. Larger planes, such as the attack bombers, may be bought in a small scale to conserve space.

3. PAINTING

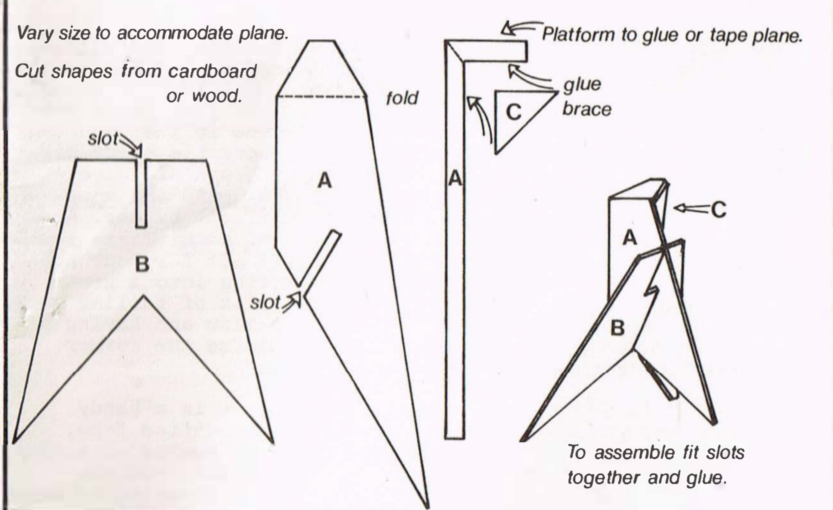
Most miniature airplane kits will have painting instructions included with them. If you wish to paint your model, I suggest you use these. Since very detailed painting would require a full article of instructions, I will say no more about it here.

4. MOUNTING

The last step in preparing your miniature airplanes for combat is to mount them. Obviously, you cannot move them across the floor, sand-table or table top as they simply take up too much room. You therefore need some way of elevating them above your other pieces. The easiest way to do this is to use a stand. If your model kit includes a stand, as many do, your problems are solved. If the kits do not contain stands, are too wide at the base to be used, or you are using replicas, you will have to build your own using cardboard, wood or some other suitable material.

Although a stand is easy to construct, you might wonder what type to build. A tripod is the best stand to use. It will stand steadily on terrain where other types of stands would wobble, and it is sturdy. It also takes up a minimum of space on the actual battlefield.

TRIPOD CONSTRUCTION



5. RULES

a. Introduction

The following rules are for WWII ground support actions. Those of you who do not use the FAST RULES booklet should use these rules as a guide in designing your own rules. If you disagree with any of the rules, remember that no one said that you could not change them.

b. The Guns

It is imperative that you know the number and type of guns that each plane mounted, where they were mounted, and whether they were fixed or mobile.

Having established this, you then need to know the range of the guns. On this you may have to approximate. An in-depth study has given me such extremes as 30 yards for a 30 cal. machinegun to 2000 yards for a 50 cal. machine gun. And as if this wasn't enough, they never state whether the given range is the maximum or the effective range. That is just the beginning of the trouble you encounter.

I therefore will not give what I think are the actual ranges of the guns, as someone is bound to disagree with me. Instead, I give the ranges I use in my games, which, you must remember, are designed to be compatible with the other ranges found in the FAST RULES booklet. The following are the suggested gun/range figures I use:

30 cal/ 4"; 7.9mm/5"; 50 cal/6"; 20mm/24"; 37mm/12"; 40mm/12"; 75mm/24"

When firing, the dice are rolled for each separate gun. Fixed guns must all fire at the same target. By fixed guns I mean all the guns mounted in the nose and wings of a plane that fire forward, or similarly classified weapons.

If you wish, you may limit the number of turns that a plane may fire, such as five per game. Otherwise, it is assumed that the plane's ammunition will not run out in the course of a battle.

c. Movement

In conducting your ground support missions, you can assume that your planes will not run out of its fuel in the course of the battle.

How your planes get into the battle in the first place is entirely up to you. I like to have the opponents secretly write out on a piece of paper, at the start of the game, when each of their planes appear on the battlefield. This order of appearance cannot be changed for the rest of the game. Thus, neither side knows when enemy planes will appear. This can be very interesting when you use ammunition limitations, as you can well imagine.

Actual movement is a definite problem. The most realistic way of having movement is to give each plane a speed in inches per turn, which is derived from its actual speed in miles per hour, and then go through a procedure such as having air movement for five turns, then the land movement, then five more air movement turns. The movement being finished, you would then conduct combat. The movement factors would be such that a 200 mph plane's maximum distance for this amount of moves would be ten times further than the maximum distance a 20mph vehicle could have moved.

I do not recommend this system for two reasons: first, the speed of an aircraft varied depending on how fully loaded it was. In the case of the Mitchell bomber, for example, the speed would vary from 165 mph to 250 mph. That is a big difference. Secondly, this system has you operating aircraft ten timesmore often than land units in a supposedly land-oriented battle.

The basis of the system that I use and recommend is that the speed of planes in relation to the speed of other units is infinity. In other words, as you move your land units, you may place any of your aircraft that happen to be over the battlefield at the moment, anywhere you wish.

Although this system is slightly artificial, it is reasonable and realistic, unless you happen to be playing on a football field or the like.

d. Bombing

Bombers must certainly have a definite number of attacks possible. These are as follows:

Dive-bombers may dive-bomb once each game. This is done by positioning the attacking plane so that the target is directly in front of it.

Attack bombers bomb twice a game, whenever the player sees fit. The attack bomber must be placed over the target if possible, or else so that the target is to the rear of the plane.

Dive-bombers attack point-type targets, except in the case of men in a 3-inch radius area. In this situation, the dice are thrown once to hit all the men in the area and if there is a hit, all men are killed.

Other than above, a"hit" without a "destroy" does no damage. Unless otherwise noted, all figures are the sum of two dice. The procedure differs in the case of the attack bomber. It attacks all targets within a two foot circle. The "hit" and "destroy" numbers are rolled for each individual/point-type target, even individual men. In addition, this includes friendly forces which may be in the area.

BOMBER CRT

Dive-bomber Attack Table

	To Hit	To Destroy
Building	4 or less	8 or less
Tank	3 or less	4 or less
Armored Pers. Carrier	3 or less	8 or less
Truck	3 or less	12 or less
Small truck or jeep	2	12 or less
88mm or larger gun	3 or less	9 or less
20mm - 75 mm gun	2	11 or less
Men in 3" radius area	4 or less	12 or less

Attack Bomber Attack Table

	To Hit	To Destroy
Building	4 or less	9 or less
Tank	3 or less	5 or less
Armored Pers. Carrier	3 or less	9 or less
Truck	3 or less	12 or less
Small truck or jeep	2	12 or less
88mm or larger gun	3 or less	10 or less
20mm-75mm gun	2	12 or less
man (for ea in 1ft radius area)	4 or less	12 or less

e. Strafing

Only fighters may strafe. To strafe, position the fighter within range of the target, pointing at the target. You then consult the correct CRT, as normal

STRAFING CRTS

Attacking Tanks

	To Hit	To Destroy
20mm	5 or less	4 or less
37mm	4 or less	4 or less
40mm	4 or less	4 or less
75mm	3 or less	6 or less

Attacking Armored Pers. Carr.

	To Hit	To Destroy
50 cal.	6 or less	8 or less
20mm	5 or less	9 or less
37mm	4 or less	10 or less
40mm	4 or less	11 or less
75mm	3 or less	12 or less

Attacking Trucks

	To Hit	To Destroy
30 cal.	6 or less	7 or less
7.9mm	6 or less	7 or less
50 cal	6 or less	7 or less
20mm	5 or less	12 or less
37mm	4 or less	12 or less
40mm	4 or less	12 or less
75mm	3 or less	12 or less

Attacking Small trucks or jeeps

	To Hit	To Destroy
30 cal	5 or less	7 or less
7.9mm	5 or less	7 or less
50 cal	5 or less	7 or less
20mm	4 or less	12 or less
37mm	3 or less	12 or less
40mm	3 or less	12 or less
75mm	2 or less	12 or less

Attacking guns 88mm and up

	To Hit	To Destroy
20mm	4 or less	7 or less
37mm	4 or less	8 or less
40mm	4 or less	8 or less
75mm	3 or less	9 or less

Attacking guns 20mm-75mm

	To Hit	To Destroy
20mm	3 or less	9 or less
37mm	3 or less	10 or less
40mm	3 or less	10 or less
75mm	2 or less	11 or less

Attacking men in 3" radius circle

	To Hit	To Destroy
30 cal.	7 or less	9 or less
7.9mm	7 or less	9 or less
50 cal	7 or less	9 or less
20mm	6 or less	9 or less
37mm	5 or less	9 or less
40mm	5 or less	9 or less
75mm	4 or less	9 or less

you mustroll the "To Destroy" number for each individual man

f. Dogfighting

Positioning planes for dogfighting is the same as for strafing, except that the targets are the planes.

DOGFIGHTING CRT

Shooting at single engine planes

	To Hit	To Destroy
30 cal	8 or less	3 or less
7.9mm	8 or less	3 or less
50 Cal	7 or less	4 or less
20mm	6 or less	5 or less
37mm	5 or less	6 or less
40mm	5 or less	7 or less
75mm	4 or less	8 or less
missiles	3 or less	8 or less

To Hit bonus:
Plus 2 when attacking planes which are bombing or strafing.

To Destroy bonuses:
Plus 2 when attacking Japanese planes.
Plus 1 when attacking Russian planes

To Destroy penalties:
Minus 1 when attacking American planes
Minus 1 when attacking two-engine or larger planes

g. Anti-aircraft fire

It is up to you to decide which guns are suitable for AA fire. These guns, once you have chosen them, have an AA range equal to one-half of their normal range when firing at land objects. Some AA guns may only be able to fire at planes.

FLAK CRT

	To Hit	To Destroy
20mm	4 or less	5 or less
37mm	3 or less	6 or less
40mm	3 or less	7 or less
88mm or 90	2 or less	9 or less

To Hit bonus:
Plus 2 when attacking planes which are bombing or strafing

To Destroy bonuses:
Plus 2 when attacking Japanese planes.
Plus 1 when attacking Russian planes

To Destroy penalties
Minus 1 when attacking American planes
Minus 1 when attacking two-engine or more planes

h. Author's Notes

Here are a couple of rules that somehow got left out. First, the range of missiles is 12 inches. This is actually only a wild guess on my part, so don't hesitate to change it. Also, air-to-ground missiles use the same strafing tables as the 40mm gun.

Adapting these rules to other types of miniature games can be very exciting and is certainly nothing to shy away from. As a hint to get you started, the rules that do not need to change from game to game are the ones on dogfighting and AA fire. I might also add that these rules may certainly be used as the basis of a pure airplane versus airplane game, miniature or otherwise.

As a last note, the whole purpose of this article has been to get more miniatures players started on what can be a very rewarding addition to their games.

REFERENCE SECTION

FAST RULES is available from the Armored Operations Society, 707 South Mattis Avenue, Champaign, Illinois 61820. The AOS is an affiliate of the IFW. The rulebook sells for a small price. At the time of writing it was $1.00.

Miniature planes, suitable for use with 20mm miniatures, are available from LOWRYS, P.O. Box 210, Belleville, Illinois 62222. Their wargaming catalog is, at the time of writing, $.50.

Many stores also carry suitable model planes.

My major sources in preparing these rules and this article, are the WWII issues of POPULAR SCIENCE, POPULAR MECHANICS, MECHANIX ILLUSTRATED, FLYING, AIR TECH and AIR TRAILS. These were very helpful and I recommend them to anyone researching in this field.

There are a number of good books on WWII aircraft around which will be covered in S&T's PASS IN REVIEW column from time to time.

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Operations Orders

by Stephen B. Patrick

Have you ever played the Germans in STALINGRAD, broken the Russians away from Lake Ladoga in the North and the Black Sea in the South by the midpoint in the game and still lost? Have you ever played the French in 1914, got caught in a mandatory mobilization variation and found the Germans deployed where you weren't without any idea as to what to do next? The awful sinking feeling as you snatch defeat from the jaws of victory may not be due to anything more complex than not knowing where you are going and the best way of getting there.

Curiously, the army has developed a device to relieve some of this unnecessary confusion - the Operations Order or OPORD. The traditional five paragraphs, complete with heading and annexes, may seem a bit like wearing a steel pot and pistol belt while playing war games. And, in its full version, perhaps it is. But between that and a few scrawled notes (if any) lies a wide range which can be used intelligently within the context of an OPORD, thereby spelling the difference between an intelligent plan and muddled chaos.

The format of the OPORD is set forth in the illustration, as it would be when complete with all the trimmings. The important thing to note is that it does follow a logical order. Paragraph 1 is a status, paragraph 2 the job to be done, paragraph 3 the means by which you will get the job done in light of the status, and paragraphs 4 and 5 the internal organization to facilitate the execution of the job. Using an OPORD does not guarantee success - it doesn't do so in wartime - but it does ensure that you will have a logical plan of operation and that, if you are unsuccessful, it will not be from lack of planning, which is all too often a major cause.

In discussing the subordinate sections of the OPORD, there seems little value in going into the window dressing - it's self-explanatory in the format sample and is not essential to obtaining the benefit of an OPORD for use in wargames.

Starting at the top, the first point for discussion is the section captioned "task org." Here is where the major subordinate commands are set out, together with the principal units under them. For a division OPORD, the task organization would list the subordinate brigades and their component battalions. In addition, the attachments and detachments would be noted here.

This has definite use when dealing with large numbers of units and can be a convenient place to indicate your mobilization points for such games as BLITZKRIEG and 1914. This is where you indicate what you have to work with. Use it in that context.

Paragraph 1(a) is valuable as it sets forth, in its original use, the intelligence data on enemy forces. If a wargamer takes the time to consider the probable alternatives available to the enemy forces, he may come up with several major alternative dispositions. Each of these will require different reactions on his part in planning his course of action. In this respect, the OPORD, as used by a wargamer, becomes not unlike an Operations Plan or OPLAN. In military usage, the OPLAN differs from the OPORD by the addition of a subparagraph, 1(d), which sets forth certain assumptions about the enemy course of action. The OPLAN then becomes the basis for the OPORD in combat. For wargamers, the difference between the two tends to blur and the distinction is not all that essential to maintain, except for the "authenticity first" type of player.

To get maximum benefit from the OPORD, the wargamer should, as a practical matter, make a separate OPORD for each enemy course of action which would affect his ability to achieve his objectives in the game. This does not mean that he should make one for every possible alternative, only that one should be made for those alternatives which would actually effect accomplishment of the objectives. Obviously, in re-enactments of historical battles, one side is initially cast in the role of attacker and the other the defender. It is foolish to seriously consider the defender opening with a major attack. If he could do so and stand a fair chance of winning in an historical game, you would be the defender, not he. That is one example of a possible alternative which, as a practical matter, may be disregarded.

Paragraphs 1(b) and 1(c) are not as applicable to a commander-in-chief's OPORD, as can be seen from the illustration, but in a multi-commander game, the OPORD for a subordinate commander would want to consider the activities of other commanders and attachments and detachments. As mentioned above, the OPLAN format would add a paragraph 1(d) for assumptions concerning enemy courses of action.

Paragraph 2 is a one sentence statement of the mission. This is one major point of value in a wargamer using an OPORD. All too often one loses sight of the objective of the game(that objective usually being the siezure of a certain piece of terrain) and becomes involved in trying to grind down the enemy as if that were the sole goal. In those games where the goal is seizure of a city and not destruction of the enemy, it is foolish to waste your strength and, more importantly, your time in trying to break the enemy line when only one hole is needed. Besides, it is a great example of one-upmanship to defeat your foe and leave his army still strong in the field. The point is that paragraph 2 provides a constant reminder as to the point on which you should concentrate your effort.

Paragraph 3(a) is a general statement of how you intend to accomplish your mission. It may be something to the effect that you will attack in three armies with a reserve following the

the beginning of the trouble you encounter.

first army. The details are set forth in succeeding paragraphs. Paragraph 3(b) and those that follow state what each major subordinate unit will do. One paragraph is devoted to each such unit and this paragraph would, in turn, become paragraph 2 of that unit's own OPORD. The last subparagraph under paragraph 3 is coordinating instructions. Here such details as one-way roads in BULGE and the priorities for Eisenbahnbautruppen, in 1914, would appear.

Paragraphs 4 and 5 only recite information of interest in a real-life situation, normally. Such elements as supply points, POW collection points, SOIs in effect and chain of command are crucial in combat but icing on the cake in a wargame. As such, they may be fairly disregarded by the average person who makes use of an OPORD in wargames.

The applications of OPORDS to wargames are many and varied. Obviously, the fellow who wants to "play the game" to the last spent round can make it out, completely with six digit CP coordinates and the rest. But even if you aren't that gung ho, a more limited use is available. The most valuable one is that you can, at your leisure, work out a few solutions to possible enemy dispositions, write them down, and when faced with one of those alternatives, perhaps months later, pull out the OPORD and know what you are going to do, instead of playing it all by ear. A second use is in the multiple commander type of game. There is nothing harder, if you are CinC, than to spell out for your subordinates your plan of operations without getting into a great debate over strategy and without running the risk of failing to fully articulate your thoughts to the other fellow and having him go off on a tangent. An OPORD should minimize the former and, if well thought-out, prevent the latter.

The OPORD is not a universal panacea, but it is a handy device which any wargamer can use, albeit in a modified form, to good advantage. Where there is more than one course of action, either on your part or on the part of your opponent, you can use an OPORD to clarify your thoughts instead of trusting to memory and chance.

Copy No._____
Unit
(classification)
Location
Date/Time Group
Order Code #

OPORD #

Ref: (maps)

TASK ORG.
[here you set out the major subordinate commands, their major subordinate commands, and any attachments or detachments]

1. SITUATION
   a. Enemy forces.
   b. Friendly forces [higher and adjacent commands]
   c. Atch & Det [usually a reference to those in the task org., with a date/time group indicating when effective]
   [d. Assumptions. (use only for OPLANS)]

2. MISSION (a one sentence statement)

3. EXECUTION
   a. Concept of operations
      (1) Maneuver
      (2) Fires [arty, with priorities; nuclear with assignments and date/time group when effective]
   b. (and following) [the missions of the major subordinate units]
   f. (or whichever is last) Coordinating instructions

4. ADMINISTRATION AND LOGISTICS

5. COMMAND AND SIGNAL
   a. Signal
   b. Command

ACKNOWLEDGE

LAUBER
Gen.

ANNEXES (numbered)

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FLASH
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(classification)

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Zero Sum Game Theory

by Paul F. Dubois

Zero-sum game theory is a mathematical tool developed to handle the following situation: two players are in a conflict situation in which they make their moves simultaneously and as a result of their choices, one player pays the other a certain "payoff." A common example of such a game is Rock-Paper-Scissors.

We assume that each player has a finite number of alternatives for his move. These alternatives are called is <u>pure strategies,</u> and he must choose one of them. Each player must decide upon his <u>grand strategy:</u> this consists of deciding the probability with which he will select each of his pure strategies. In some games, this amounts to playing one pure strategy every time, but usually one cannot be so complacent. Someone who plays "Rock" every time will be quickly discovered and defeated.

To make thse games easier to handle, we list the pure strategies for the first player (Player 1) on the left, and those for the second player (Player 2) on the top of a <u>matrix</u>, that is, an array of numbers. The element in the "i"th row and "j"th column tells us how much Player 2 must pay to Player 1, if Player 1 plays his "i"th strategy and Player 2 plays his "j"th strategy.

FIG. 1

	Rock	Paper	Scissors
Rock	0	-1	+1
Paper	+1	0	-1
Scissors	-1	+1	0

This game becomes more exciting if, instead, you use the following payoff matrix:

FIG. 2

	Rock	Paper	Scissors
Rock	0	-1¢	+100¢
Paper	+1¢	0	-1¢
Scissors	-1¢	+1¢	0

Surprisingly enough, this changes the game from an even game to one favoring the first player, but only to the tune of about 1/3¢. It is therefore a good swindle to get someone to pay you 1¢ a game for the privilege of being first.

The amount that the first player can, on the average, secure with best play is called the value of the game. One can get a fast approximation on this number as follows: take the least number in each row (remember that -4 is less than +1) and then take the largest of the numbers so obtained and call it "M." Now take the largest number in each column and call the least of those "m". Then

"M"is less than or equal to VALUE is less than or equal to "m"

If M=m, the game has a "saddle-point:" the first player's best grand strategy consists of playing just one pure strategy every time, namely, the row in which M appears as the least element. For example, in

2	1
3	0

we have M=1, m = 1. The first player plays first strategy. In the following game,

2	3
3	0

we have M=2, m =3. The value of the game is between 2 and 3 (in fact, it is actually 2.25).

DOMINANCE: In analyzing a game, the first thing to do is get rid of those strategies that are obviously inferior for one player or the other. To be precise, if one row is, term by term, less than another row, eliminate it. If a column is, term by term, greater than another column, eliminate it.

Example:

	#A	#B	#C
Strategy #1	2	1	-1
Strategy #2	3	2	5
Strategy #3	-1	3	6

Only a fool would play strategy #1 because #2 is better no matter what the second player plays. So we strike #1, and here is what is left.

	#A	#B	#C
Strategy #2	3	2	5
Strategy #3	-1	3	6

Cognizant that #1 will not be played, the second player should never play #c because, term by term,#B is better for him (remember, the numbers represent what he must pay). In the remaining game,

	#A	#B
Strategy #2	3	2
Strategy #3	-1	3

none of the strategies is dominated.

2 X 2 GAMES: If each player has just two strategies left after dominated ones are eliminated, then we can easily solve the game.

Step 1. Check for a saddle-point (m=M). If there is one, you're done. Do not forget to do this since you may get an erroneous answer if you do only step 2.

Step 2. If the matrix is:

a	b
c	d

then the following formulas give the correct proportions for the employment of each strategy:

Player #1	#1:	c-d
	#2:	a-b
Player #2	#1:	b-d
	#2:	a-c

Compute the above numbers and discard any negative signs

Example:

3	2
-1	3

Player #1	#1: 4
	#2: 1
Player #2	#1: 1
	#2: 4

Thus, player 1 should slect #1 4/5 or 80% of the time, and #2 1/5 or 20% of the time. To find the value of the game, merely compute what would happen if the second player always played the same strategy-you must choose one for which the probability of being plaved is not zero. Thus, in this game, value = (4/5)(3) + (1/5)(-1) = 11/5 = 2.2.

It is a peculiarity of the theory that if one player is using the correct strategy, then the results will be the same no matter what the second player does, unless the second player touches the forbidden strategies. For example, in the following game,

2	-2
-1	4

the second player should mix his strategies at a ratio of 2/3: 1/3. If he does, he will keep his losses down to an average of 2/3 units per game, regardless of the play of the first player.

Bigger games: If you have a bigger game to analyze, check for a saddle-point. You might luck out! Secondly, check for dominance, and see if the game will reduce to 2 x 2. A general discussion of precise solutions for bigger games is impossible within the scope of this article. However, there is a method available for obtaining approximate solutions. Essentially, one imagines each player picking a strategy so that "historically" he would have done the best by choosing that strategy every time.

We start with a matrix and below it we copy the first row. We place an asterisk on the largest element in that row. We copy the column in which the asterisk has been placed to the left of the matrix. Then we mark the smallest element in that column with an asterisk and add the row in which it appears to the row below the matrix, writing it beneath. Again, we choose the largest element in this new row and mark it. Then, to the column on the left we add the column in which the mark appears. This process is repeated ad nauseum (the longer the better). Then, add up the number of asterisks in each row and column. These are then the proportions in which one should play the strategies!

FIG. 3

	#A	#B	#C
Strategy #1	1	0	-1
Strategy #2	-1	1	0
Strategy #3	0	-2	3

```
 1  0 -1  1  1  0* 1  0  0  0* 0 -1*
-1  1  0 -1* 0  0 -1*-1* 0* 1  2  2
 0 -2  3  0 -1* 1  1  4  2  0 -2* 1
 1* 0 -1
 0  1*-1
 0 -1  2*
 1*-1  1
 0  0  1*
-1  1* 1
-2  2* 1
-1  2* 0
-1  0  3*
-1  0  3*
 0  0  2*
```

At this point, nausea sets in. The approximate strategies are:

#1: 3/9 #A: 2/10
#2: 4/9 #B: 4/10
#3: 2/9 #C: 4/10

The actual correct strategies are, in fact,

Player 1: 4/9; 7/18; 1/6
Player 2: 1/3; 7/18; 5/18

and the value of the game is +1/18

Reality into game: In translation of real (i.e., social, military, boardgame) situation into a game matrix one must be cognizant of several facts. First, the "ij" entry in the matrix should represent the average payoff if the players play strategies "i" and "j" respectively. For example, an entry of 0 may mean that the players flip a coin, with one player keeping the coin if it is heads, the other if it is tails.

Let us consider the new Avalon Hill matrix in KRIEGSPIEL. Suppose two 4-factors attack one 4-factor. The two-to-one matrix is shown in figure 4.

Battle Odds	1 to 1			2 to 1			3 to 1		
Attacker → / Defender ↓	Engage & Hold No Advance after combat	Escalating Assault Advance 2 squares after combat	Blitzkrieg Advance 4 squares after combat	Engage & Hold No Advance after combat	Escalating Assault Advance 2 squares after combat	Blitzkrieg Advance 4 squares after combat	Engage & Hold No Advance after combat	Escalating Assault Advance 2 squares after combat	Blitzkrieg Advance 4 squares after combat
A Abandon Position Retreat 4 squares after combat	NC	NC	A-Elim D-Elim	NC	NC	A-Lose 4 D-Elim	NC	NC	– – D-Elim
B Fighting Withdrawal Retreat 2 squares after combat	NC	A-Elim D-Elim	NC	NC	A-Elim D-Elim	– – D-Elim	NC	A-Lose 4 D-Elim	– – D-Elim
C Standfast No retreat after combat	– – D-Elim	NC	A-Elim D-Elim	A-Lose 4 D-Elim	– – D-Elim	A-Lose 4 – –	– – D-Elim	– – D-Elim	A-Lose 4 –.–
D Hold-at-all-Costs No retreat after combat	A-Elim D-Elim	A-Elim D-Elim	A-Lose 4 – –	A-Lose 4 D-Elim	– – D-Elim	A-Lose 4 D-Elim	A-Lose 4 D-Elim	– – D-Elim	A-Lose 6 D-Elim

Now each player must decide what numbers to correspond with each of these events. One method would be to let +1 represent one net combat factor won. Next, how much is a retreat or advance worth to the player? Suppose that the battle is taking place in open terrain which is of no value to either player. Then the matrix of the battle will be:

$$\begin{matrix} 0 & 0 & 0 \\ 0 & +4 & -4 \\ 0 & -4 & +4 \\ 0 & -4 & 0 \end{matrix}$$

Now the analysis: the smallest element in each row is, respectively, 0, -4, -4, -4. The largest of these is 0, from row one. For the columns, the largest elements are 0, 4, 4 and the smallest of these is 0. Hence, there is a saddle point. The attacker should play "Hold" and the defender should play "Abandon."

Suppose that the situation is such that an advance of four hexes after combat will capture a city worth 5 points. Then the matrix would be:

$$\begin{matrix} 0 & 0 & -5 \\ 0 & +4 & -9 \\ 0 & -4 & -1 \\ 0 & -4 & -5 \end{matrix} \qquad \begin{matrix} M = -4 \\ m = -1 \end{matrix}$$

The fourth row is dominated by the third row and the first column is dominated by the third column. Striking these out leaves:

$$\begin{matrix} 0 & -5 \\ 4 & -9 \\ -4 & -1 \end{matrix}$$

Solving this matrix depends on the fact that the two players can have the <u>same</u> number of strategies with probability not zero in their grand strategies. Here we see that since the attacker is going to pick between two strategies that the defender will not have to use all three of his strategies, and one can be assigned probability zero. The best way to find the solution is sophisticated and will not be dealt with here. Fortunately, there is a tiresome but accurate way to proceed.

Solve the three games obtained by striking out each of the rows in turn and then test the solutions in the original game. One of the "subgames" in this problem is:

0	-5
4	-9

This game has a saddle point. But if the defender plays the indicated strategy in the original game, he loses 5 units per game instead of between 1 and 4. Another subgame is:

0	-5
-4	-1

The indicated first player's grand strategy is a 3:5 ratio. Computing the value of the 3 x 2 game gives 0(3/8) + 4(0) + (-4)(5/8) = -20/8 against the first column,and (-5)(3/8) + (-9)(0) + (-1)(5/8) - -20/8 against the second. The second player's grand strategy is 4:4. Checking this against each row gives values of -5/2, -5/2, -5/2, respectively. The equality of the values so obtained shows that this solution is a solution to the game. It is permissible that the value against a zero-probability strategy be different.

The applications of this theory are obviously not in over-the-board play, as your opponent is not likely to wait while you compute madly for twenty minutes per battle. It might be useful in mail games, however. The really important use is for the game <u>designer,</u> a role most of us assume now and then. Cognizant of the ideas of dominance, one could invent cleverer Combat Results Tables than the KRIEGSPIEL one. For example, in their 2-1 table, the "Hold-at-all-costs" row is dominated by the "Standfast" row in <u>any</u> situation. It is a waste of "Design Space."

The most interesting questions are those concerned with the construction of the game matrix from the "real" situations. In effect, you are making a mathematical model of a complicated situation. Two people may do this in quite distinct ways. For example, in the problem above, we estimated the capture of a city as being worth 5 combat factors, which is obviously a guess. What change in the grand strategy occurs when the game matrix is changed by a small amount? What is the cost of playing, in the real situation, the strategy indicated by a slightly "wrong" matrix? Every player of STALINGRAD knows that losing an "8" is worse than losing two "4's." How much should we value these pieces?

Strategic considerations can be analyzed just like tactical situations, especially in recent games like GOEBEN, which assign point values for fulfilling objectives. It is my view that such victory conditions are also valuable in that they can be simply adjusted to balance a game which long experience reveals is not fair, and also to allow for interesting tournament scoring.

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Flight of the Goeben Revisited

By Jay Richardson

The tactical FLIGHT OF THE GOEBEN game enclosed with issue #21 of Strategy & Tactics was an excellent one in all respects except one: the chances of scoring hits. In the game as it is, the chances of scoring a hit on a ship at a given distance is the same regardless of whether it is moving or not. I feel this is completely unrealistic.

Rather than try to vary the Odds of Hitting Table for each separate speed, I have drawn up what I call the Straddle Table. For those unfamiliar with the word, straddling a ship is similar to throwing a handful of rocks at a stick floating in a pond. You have to put all your shells in the immediate area of the ship to score a hit and the Straddle Table tells you the odds of doing that.

THE STRADDLE TABLE

RANGE: 22,500 yds - 17,000 yds

Length of target's last move	Chances of straddling	Dice Rolls
No move	100%	2 through 12
1 inch	87%	2 through 9
2 inches	75%	4 through 9
3 inches	62%	2,4 through 8
4 inches	50%	4 through 7
5 inches	37%	3,6,7
6 inches	25%	4,7

RANGE: 16,500 yds - 7,500 yds

Length of target's last move	Chances of straddling	Dice Rolls
No move	100%	2 through 12
1 inch	92%	2 through 9, 11
2 inches	83%	2,4 through 9
3 inches	75%	4 through 9
4 inches	67%	2 through 7, 11
5 inches	58%	2,4 through 7
6 inches	50%	4 through 7

RANGE: 7,000 yds - 500 yds

Length of target's last move	Chances of straddling	Dice Rolls
No move	100%	2 through 12
1 inch	96%	2 through 9, 11,12
2 inches	92%	2 through 9, 11
3 inches	88%	2 through 9
4 inches	83%	3 through 9
5 inches	79%	4 through 9
6 inches	75%	4 through 9

As you can see, there are three different parts to the Table, each for different ranges.

To use the table, you must first round off the distance the target has moved to the nearest inch. For example, if the ship which is the target moved 3.4 inches on the last turn, you round off to 3 inches. If it moved 3.5 inches, you round off to 4 inches.

Each ship that fires must use the Table at least once. If a ship is firing its main battery at one ship and its secondary battery at another, it rolls twice: once for the main battery and once for the secondary battery. Implicit in this system is that all guns of a particular battery must fire at one target.

Rather than being strictly accurate (as the gunnery ability of each ship will, in fact, vary) this table attempts to recreate the "feel" of the problem of hitting a moving target at various ranges.

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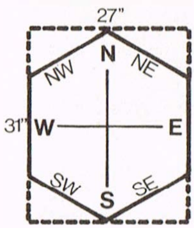
Jutland with a Battleboard

by Robert Meith



As anyone knows who has played JUTLAND, the biggest problem is where to have combat. The only easy way to have combat,usually, is to play in a very large room or gym. Many players have suggested solutions, but often their answers take much of the realism out of the game. So here is my solution: instead of using a Battle Area Marker to give you your battle positions, use a blow-up of the hexagon which the Battle Marker is supposed to help represent. Then, instead of moving the ships until you run out of space, you can move from one hexagon sheet to another, "leap-frogging" the hexagon sheets ahead of each other.

To make these "super hexagons," you have to invest some time and money. First, go to an artists' supply shop and purchase six pieces of artist's board in sections at least 27" x 31" (they are usually larger, any way). The price will vary according to the thickness and size but on the average it costs $.60 per section. The first step then is to cut the artist's board to exactly 27" x 31". Then make a cross through the center of the board. Consider the long arms of the cross to be in a north-south direction and the short arms in an east-west direction. Make a tic mark 7 3/4" from the north and south ends of the board, on both the east and the west sides. Connect those points with the north and the south points, as indicated in the illustration, cut off the parts indicated, mark the ends of the cross to indicate North, South, East and West and the four cut off sides to be Northeast, Southeast, Southwest and Northwest. Then have fun playing.