

TEMPO MILITARY PLANNING GAME

EXPLANATION AND RULES FOR THE PLAYER*

*This game was developed originally as a strategic planning exercise by H. Hatry, F. Jackson, and P. Lever of the Economic Analysis Section of TEMPO, General Electric Company, Santa Barbara, California. It was subsequently adapted by DRMI for use as a resource allocation exercise.

THE GAME

The game is played between two teams. Each team begins the game from the same starting point. The game is made up of simultaneous plays, called years. Each year, the teams are given a budget and must decide how to spend their budget that year. At the end of each year, there is a chance that a war will occur. In the event of a war, a score is calculated and a winner is announced. The game continues for a fixed number of years, no matter how many wars occur.

Format of the Game

At the beginning of each year, the team receives a budget form with a budget (amount of money) written on the top. The budget can be spent in four broad ways: (1) the operation of existing weapon systems, (2) research and development into future weapon systems, (3) the acquisition of additional or modified weapon systems, and (4) intelligence and counterintelligence. The team must fill out the budget form and give a copy to the umpire at the time specified on the game schedule. Additionally, a probability of war is written at the top of the budget form. This probability indicates the likelihood of a war occurring in the year. The outcome, whether or not a war actually occurs, will not be known until **after** the budget form is turned in.

The score:

There are four **types** of weapon systems: Offensive A, Offensive B, Defensive A, and Defensive B (OA, OB, DA, and DB, respectively). Each Weapon System Type is comprised of individual weapon systems, such as OA1, OA2, and so forth. When a team decides to pay to operate a system, the system produces an output that is measured in "**Utils**". The Util is a measure of effectiveness. The amount of utils produced by any one system is subject to diminishing returns once that individual system produces in excess of 2000 utils.(see Enclosure 1 for more detail).

In the event of a war, the team with the greatest net utils wins the war. The losing team's budget will be reduced in the following year by the amount of the difference in net utils produced.

Net utils are calculated as the sum of the team's offensive utils minus the defensive utils produced by the opposing team. Specifically, a team's Net Utils is calculated as follows:

(Type A Offensive Utils) - (Opposing Team's Type A Defensive Utils)

PLUS

(Type B Offensive Utils) - (Opposing Team's Type B Defensive Utils)

A numerical example follows:

NUMERICAL EXAMPLE:

Suppose that a war occurs at the end of year one and :

Team X operated 20 units of OA1, 40 units of OB1, 20 units of DA1, and 15 units of DB1.

Team Y operated 10 units of OA1, 35 units of OB1, 50 units of DA1, and 12 units of DB1.

Each unit of: OA1 produced 120 utils.

OB1 produced 20 utils.

DA1 produced 15 utils.

DB1 produced 50 utils.

<u>X TEAM</u>		<u>Y TEAM</u>	
OA _x	2,360	OA _y	1,200
DA _y	<u>-750</u>	DA _x	<u>-300</u>
		*20% over-defense credit	<u>-10</u>
Net(A)	1,610	Net (A)	890
OB _x	800	OB _y	700
DB _y	<u>-600</u>	DB _x	<u>-750</u>
		Over-defense	<u>-50*</u>
Net (B)	200	Net(B)	0
<i>Total Net Utils, team X</i>	1,810	<i>Total Net Utils, team Y</i>	890

Team X won. Team Y's budget will be reduced by 1810-890=920 the following year. In addition, both teams' budgets will be reduced by 400 the following year due to the occurrence of war.

*Defensive weapon systems only defend against your opponent's offensive weapon systems of the same Weapon System Type -- your DA weapons defend against the enemy's OA weapons, and your DB weapons defend against the enemy's OB weapons. Any DA system counts against any OA system of the enemy, and likewise for B systems -- i.e., utils from operating DB1, DB2, etc. defend against OB1, OB2, etc. If you over defend against a force type, 20% of the overdefense amount is applied to your defensive capability in the other category.

PLAY OF THE GAME

At the beginning of the game, your team will be given the following important information:

- A Game Schedule.
- Budget Allocation Forms with your budget for the first year and the probability of war.
- A sheet showing your Initial Weapons Systems including information on the inventory, maximum acquisition rate, costs, and utils.
- A set of Weapon System Information Sheets describing the current status of newly available weapons systems or modifications (for example, see enclosure 2).

INTELLIGENCE

Intelligence is available at a cost of \$100 per category (Offensive Operating Forces; Defensive Operating Forces; Offensive R&D, Acquisition and Modification; Defensive R&D, Acquisition and Modification). Counterintelligence costs \$300 and covers all four intelligence categories. The information you receive depends on whether your opponent buys counterintelligence:

- **If your opponent does not buy counterintelligence:**
 - For Operating Forces: The type and quantity of operating systems.
 - For R&D, Acquisition and Modification: The type and quantity of systems acquired or modified and a list of systems in R&D.
- **If your opponent buys counterintelligence:**
 - For Operating Forces: The type of system and the direction of change in quantity (up, down or constant), i.e., DB1 up, down, or unchanged.
 - For R&D, Acquisition and Modification: The systems in R & D and only the type of system acquired or modified.

Intelligence reports are prepared after the budget submissions.

PROBABILITY AND RESULTS OF WAR

The probability of war will be announced at the beginning of each year and is for that year only. If war occurs, it will happen after your budget decisions for that year have been completed but before the next year begins. Neither team can declare a war. If war occurs, the outcome (score) will be announced by your umpire near the beginning of the next year. If war occurs, each team will lose \$400 from its next year's budget. In addition, the losing team's budget will be further reduced by a \$ amount equal to the difference in net utils produced that year (\$920 in the scoring example on page 2).

WEAPON SYSTEM INFORMATION SHEETS

During the game, Weapon System Information Sheets will be provided for new systems, which you may choose to “move” through the following stages:

Research and Development (R&D)

R&D on new systems can take from 1 to 3 years to complete. Weapon System Information Sheets show **historical and current values in BOLD. These values are final and exact.** Information about future costs and util values are estimated, *will appear in ITALICS and are subject to change (see Enclosure 2).* If you budget the R&D for "This Year", you will be given an updated Weapon System Information Sheet at the start of the next year. In the final year of R&D, you will be given a **FINAL** Weapon System Information Sheet (with final and exact cost and util data). None of the R&D opportunities is mandatory. R&D on a weapon system may be discontinued at any time. However, if it is resumed in a later year, a penalty of \$300 or one-half of the current R&D, whichever is smaller, will be charged and must be included by the team in its budget.

Acquisition

A team may acquire additional units of any system already in the inventory at any time. Units of any new system may be acquired during the final year of R&D and thereafter. The maximum annual acquisition rate for any particular system is stated on the Weapon System Information Sheet.

Modification

Some Weapon System Information Sheets, provide information about modification of existing systems. A modification takes one year to complete and involves the following special rules:

- a. Only one year of R&D is required; thus a FINAL Weapon System Information Sheet with exact cost, util, and annual modification rate data is provided (see Enclosure 3).
- b. Existing units not being modified can be operated at their original cost and util values and can be modified in later years. Units being modified can either be operated at their original cost and util values or can be taken out of operation during the year of modification.
- c. The modified units are available the next year and operate at their new (modified) cost and util values.
- d. After all existing units have been modified, additional units of the modified system can be acquired at a total cost equal to the procurement cost of the original system plus the per unit modification costs.

Operating

A team may operate any unit of a weapon system in inventory at the start of a year. Operation is not mandatory, but if existing units are not operated, they are permanently lost from the inventory. The exception is units undergoing modification. Units acquired in one year cannot be operated until the following year.

BUDGET ALLOCATION FORM

In each year of the game, your team will be given two copies of a Budget Allocation Form to record all decisions to: perform R&D, acquire/modify units, operate units and buy intelligence and/or counterintelligence. A completed Budget Allocation Form must be handed in to your umpire at the end of each game year. The other copy is for your team's records.

An example of a completed Budget Allocation Form (see Enclosure 4) is provided only to illustrate the proper entries and arithmetic required to complete the form and may not reflect the actual numbers used in the game. **Do not interpret this example as indicating "good" or "bad" play.**

The budget will change from year to year. You will have no information on future budgets except during the final five years.

PENALTIES

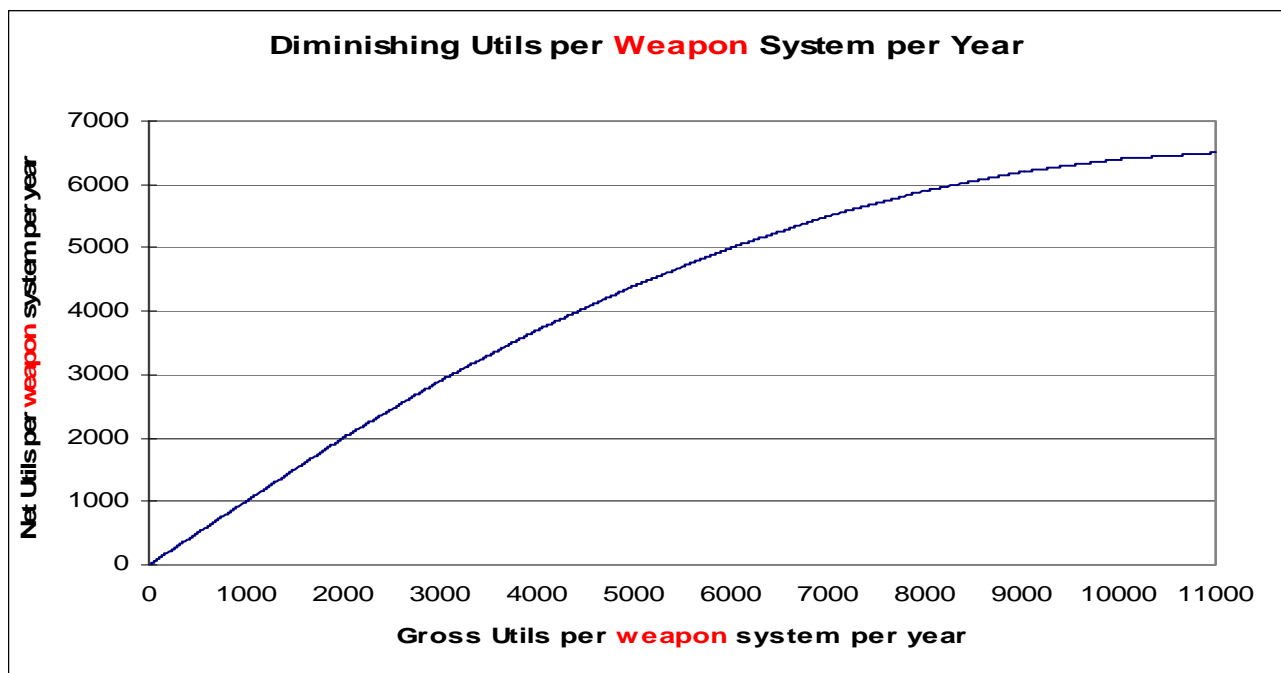
There are three special penalties that can affect your budget:

- a. If the Budget Allocation Form is submitted late, the team will be penalized \$50 per minute for the first five minutes and \$100 for each additional minute. The penalty will be subtracted from the next year's budget.
- b. A team that exceeds its budget in one year will have its next year's budget cut by twice the amount of the over-expenditure.
- c. Funds not used in any one year are lost.

TOO MUCH OF A GOOD THING: DIMINISHING UTILS PER WEAPON SYSTEM PER YEAR

NET UTILS of any weapon system (e.g. OA1) are calculated as follows:

GROSS UTILS	NET UTILS
1 - 2,000	Same as GROSS UTILS
2,001 - 3,000	2,000 plus 90% of amount over 2,000
3,001 - 4,000	2,900 plus 80% of amount over 3,000
4,001 - 5,000	3,700 plus 70% of amount over 4,000
5,001 - 6,000	4,400 plus 60% of amount over 5,000
6,001 - 7,000	5,000 plus 50% of amount over 6,000
7,001 - 8,000	5,500 plus 40% of amount over 7,000
8,001 - 9,000	5,900 plus 30% of amount over 8,000
9,001 - 10,000	6,200 plus 20% of amount over 9,000
10,001 - 11,000	6,400 plus 10% of amount over 10,000
Over 11,000	6,500 maximum net utils



WEAPON SYSTEM INFORMATION SHEET

Weapon System Designation

Note: All numbers in **BOLD** are **FINAL & EXACT**
 All other numbers are *estimated* and appear in *italics*

	<u>This Year</u>	<u>Next Year</u>	<u>Final Year</u>	<u>1st Year Operating</u>
<u>COSTS</u>				
Research and Development	\$400	<i>\$600</i>	<i>\$500</i>	
Acquisition			<i>\$200/unit (Max: 15/yr)</i>	
Operating				<i>\$250/unit</i>
<u>UTILS</u>				<i>400/unit</i>

Other Information:

Total R&D costs *estimated* to be \$1500. This system can be acquired in 3 years and operated the following year.

Year 1

WEAPON SYSTEM INFORMATION SHEET

**Weapon System Designation (MOD)
(FINAL)**

Note: All numbers are **FINAL & EXACT**

<u>Final Year</u>	<u>1st Year</u> <u>Operating</u>
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COSTS

Research and
Development

\$200

Modification

**\$50/unit
(Max: 25/yr)**

Operating

\$80/unit

UTILS

80/unit

Other Information:

If R & D of \$200 is budgeted this year, modification of up to 25 units per year can also start this year.

Units being modified can either be operated at their original cost and will yield their original util value or can be taken out of operation for the year of modification. In either case, the modified units are available to operate the following year at their new operating cost and util value.

Year 1

TEMPO Game Overview

Review these
key points

The game is played between two teams. Each team begins the game from the same starting point. The game is made up of simultaneous plays, called years. Each year, the teams are given a budget and must decide how to spend its budget that year. At the end of each year, there is a chance that a war will occur. In the event of a war, a score is calculated and a winner is announced. The game continues for a fixed number of years no matter how many wars occur.

1

At the beginning of the first five years, the team receives a **budget form** with a budget (amount of money) written on the top. The budget can be spent in four broad ways: (1) operation (2) acquisition (3) research and development, and (4) intelligence. The team must fill out the budget form and give it to the umpire at a specified time as described on the game schedule.

2

Also at the beginning of each year, the team may receive information about **new weapon systems** that may become available for purchase.

WEAPON SYSTEM INFORMATION SHEET		Weapon System Designation			
		This Year	Next Year	Final Year	1 st Year
COSTS	Research and Development				
	Acquisition				
UTILS	Operating				
	Operating				

WEAPON SYSTEM INFORMATION SHEET		Weapon System Designation			
		This Year	Next Year	Final Year	1 st Year
COSTS	Research and Development	\$400	\$600	\$500	
	Acquisition			\$200/unit (Max: 15/yr)	
UTILS	Operating			\$250/unit	
	Operating				400/unit

BUDGET ALLOCATION FORM

YEAR 1 BUDGET \$12000 WAR PROBABILITY .45 TEAM 7X

FORCE UNIT TYPE	FORCE UNIT NUMBER	R&D			ACQUISITION/MODIFICATION		OPERATING	
		R&D COST	# OF UNITS	UNIT COST	TOTAL COST	# OF UNITS	UNIT COST	TOTAL COST
OFF A	OA1					20	150	3000
	OA2	600	24	75	1800			
OFF B	OB1		6	50	300	40	30	1200
	OB2	400						
DEF A	DA1					100	20	2000
	DA2	400						
DEF B	DB1					15	60	900
	DB MOD	200	10	50	500			
SUBTOTALS:		\$1600			\$2600			\$9000

INTELLIGENCE: \$100 per category		SUB TOTALS:	
Offensive: Force Structure	\$100	R&D	\$1600
R&D / Acq / Modification	\$100	ACQ/MODIF	\$2600
Defensive: Force Structure	\$100	OPERATING	\$9000
R&D / Acq / Modification	\$100	INTELL/CI	\$300
COUNTERINTELLIGENCE (CI): \$300	\$300		
SUB TOTAL:	\$300		
GRAND TOTAL (R&D + ACQ/MODIFICATION + OPERATING + INTELL/CI)			\$12000

3

When a weapon system is operated, it produces **utils**. **Utils** are used to score the game.

Rules to Remember

1. Only operating units produce utils.
2. Units not operated are permanently lost.
3. A unit must be acquired at least one year prior to being operated.
4. A unit may be, but is not required to be, operated in the year it is being modified.
5. Funds not used in any one year are lost.
6. Penalties are incurred if the budget is exceeded in any year.
7. Penalties are incurred if the budget form is not submitted on time.
8. No team may declare war.

The Score: Your job is to outscore your opponent in the years that war occurs. Your score is roughly calculated (see rules for precise example) as:

YOUR Offensive 'A' type utils
minus
THEIR Defensive "A" type utils
plus
YOUR Offensive 'B' type utils
minus
THEIR Defensive 'B' type utils

Good Luck!