A STRATEGY GAME OF AMERICA'S NATIONAL PASTIME
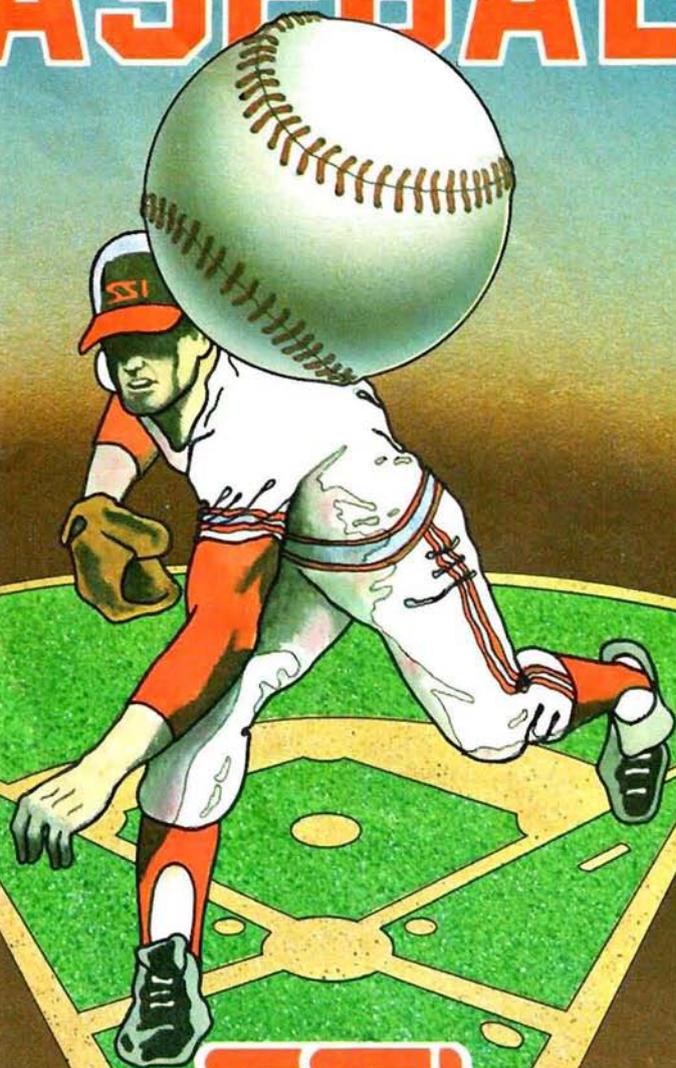
COMPUTER BASEBALL™

SSI

STRATEGIC SIMULATIONS INC

LIMITED WARRANTY

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NOTE: The rules of baseball apply in all cases unless otherwise specified.

INTRODUCTION

Baseball is a game of both strategy and statistics. Opposing managers manipulate pinch hitters, infield positions, relief pitchers and base runners, trying to obtain that small statistical edge which can mean the difference between victory and defeat. COMPUTER BASEBALL™ allows you to manage some of baseball's greatest teams, and make those key managerial decisions yourself. This game is a realistic simulation of Major League baseball, incorporating numerous statistical parameters to determine the outcome of every play.

This manual explains how to play the game using any of the 28 teams provided, as well as how to enter data for new teams. If you are reasonably knowledgeable about baseball and about your computer, you can get started playing the game almost immediately by reading the sections on STARTING A GAME and THE DISPLAY, and referring to the players' aid cards to see what options are available to you on offense and defense. You can then come back later and read more about the details of the various actions, or about how to enter or revise team data. Available for use on the game disk are 28 Major League teams from the past. These teams are described in the separate Famous World Series Matchups manual.

PARTS INVENTORY

A. Game Box
B. Rule Book
C. 5¼" Game Disk
D. Two Players' Aid Cards
E. Famous World Series Matchups Manual

LOADING THE GAME

APPLE (DOS 3.2 or DOS 3.3): Boot your game disk and the game will begin automatically. If you are using an Apple II with PASCAL, you must use your BASICS disk. If you are using an APPLE III, you must first go into APPLE II Emulation Mode.

ATARI (DOS 2.0S): Boot your disk and the game will begin automatically.

COMMODORE 64: Turn on your computer and disk drive and insert the game disk in your drive. Type LOAD "*", 8 (RETURN). When the program is loaded, type RUN (RETURN).

SAVING A GAME (PART I)

During play if you choose to save the game, you will need an additional disk to store the data. Once the game is saved, you will be able to restart it from the point at which you stopped.

APPLE: The disk must be initialized for SSI use by following the instructions included in the program.

ATARI: The disk must be formatted for use by following the instructions included in the DOS Reference Manual.

COMMODORE 64: The disk must be initialized for use.

STARTING A GAME

When you boot the COMPUTER BASEBALL game disk, you will be given the options of 1) playing a game against the computer, 2) playing a 2-player game, 3) entering data for a new team, 4) reviewing or editing data in an existing team data file, or 5) demo game. Selecting either of the first two options will lead directly to playing a game, while options 3 and 4 allow you to return to this same 5-option menu after you are finished working with the team data file. The procedures available under options 3 and 4 are described in the section on Entering and Revising Team Data.

Select either of the game-playing options, 1 or 2, and you will be asked whether you want to play a new game or continue a game which had been saved previously. To replay a saved game, the only additional information needed is the file name under which the game was saved. (**APPLE only:** You will need to indicate also whether you want to use keyboard or paddles to input offense and defense actions to the computer.)

When playing a new game, you will be provided a menu for selecting the name of the visiting team and the name of the home team. Data for these teams will be read in from data files stored either on the game disk or on a separate team data disk. Next indicate whether or not you want to use designated hitters to bat for the pitchers. Managers now will be prompted to enter their starting line-ups in the following sequence: home team pitcher, visiting team pitcher, home team batting order, and visiting team batting order. This allows each manager to know what pitcher his team will be facing when he is selecting the rest of his line-up.

Just before selecting the starting pitchers, you will be asked if you wish to enter "days

since last pitched" data for each pitcher. If you answer (Y)es, then you will be prompted to enter, for each pitcher, the number of days since he last pitched (yesterday = 1, etc.), and the number of innings pitched that day (rounded to a whole number). Pitchers considered to be not fully rested will subsequently have their names printed inversely (black on white) in lists of available pitchers, to remind you that these pitchers will not be as effective as normal if called upon to pitch. The formula used for determining whether a pitcher is rested is described in the section on Pitcher Effectiveness.

Entering your starting line-up consists of identifying the player and pressing RETURN, and then entering his position and RETURN for the nine spots in your batting order. (On the APPLE, the player number and position, separated by a comma, may be entered at the same time.) Each player is identified by a roster number (1 to 25), and positions are specified using the following abbreviations:

P	Pitcher (C-64: PI)	**LF**	Left Field
C	Catcher (C-64: CA)	**CF**	Center Field
1B	First Base	**RF**	Right Field
2B	Second Base	**DH**	Designated Hitter
3B	Third Base	**PH**	Pinch Hitter
SS	Shortstop		

A player entered without a fielding position will automatically be assigned the first defensive position listed.

As each player is entered in the line-up, his roster number on the screen will be replaced by his sequence number in the batting order, printed black on white. When all nine players have been entered, you will be shown your indicated batting order and asked to OK it. The computer then will check to see that there are no errors (e.g., two players playing the same position) before proceeding.

Pitchers may not be used in any position other than pitcher, and non-pitchers cannot be used as a pitcher.

PLAYING A GAME

COMPUTER BASEBALL is played in the same manner as real baseball. As each batter comes to bat, the defensive manager can exercise a variety of options, such as repositioning his infield, holding runners more closely, or trying to pitch around the batter. Likewise the offensive manager can choose among several possible options, such as

bunt, steal, hit and run, or sending up a pinch hitter. Once the offensive manager has indicated his batting strategy, the ball is pitched and the results of whatever play occurs are shown on the display.

THE DISPLAY

Displayed on the screen while a game is in progress are a scoreboard, batter and pitcher status information, and a representation of the playing field. The bottom line on the screen is used to solicit inputs on actions to be taken and to describe the results of each play.

The scoreboard display shows a standard inning-by-inning run history and a cumulative total of runs, hits and errors. The scoreboard only shows nine innings, so in extra inning games the first nine-inning history will be erased and the next nine innings will be displayed. The inning numbers at the top of the scoreboard will not be changed, however.

Below the scoreboard and to the left of the field, selected batter and pitcher data are presented. The current batter (with his batting average), and the next scheduled batter are listed, along with the current pitcher. The names of any pitchers currently warming up in either bull pen are also shown. A '+' symbol will be printed in front of the name of any pitcher who has been warming up long enough to be fully ready to come into the game.

The playing field display provides a visual indication of the positions of the defensive players, whether the pitcher and the batter are right or left handed, and the base running abilities of any runners on base. A partial animation of the action on the field is also displayed. Each pitcher-batter interaction is represented on the display by a single pitch. The result of that interaction is then represented graphically on the field, and described verbally at the bottom of the screen. A batted ball is represented by the ball moving to a point on the field where it will be played by a fielder (except for home runs!). On base hits, the ball is simply returned to the mound. The ball may be thrown to one or more bases, if necessary, on outs. The movement of runners and fielders are not shown.

The offense and defense action inputs for the visiting team will appear on the lower left of the display, and those for the home team on the lower right. Plays are selected by typing the two letter command, followed by 'RETURN'.

(**APPLE only:** Selecting a play in the paddle mode is done by turning the knob until the desired action is displayed on the screen and then pushing the button.)

DEFENSE ACTIONS

The defensive manager has several different types of actions available, namely: 1) setting the infield position, 2) setting the outfield position, 3) indicating how close to hold base runners, 4) making pitching changes, 5) making a defensive substitution, 6) saving the current game status, and 7) indicating how to pitch to the batter. Decisions by the defensive manager are made before those of the offensive manager, and are terminated by selection of one of the three possible ways to pitch to the batter. If, however, the offensive manager inserts a pinch hitter or a pinch runner, then the defensive manager's decision-making phase is repeated.

Each of the defense actions will now be described. For easy reference, these are listed on one side of the Player's Aid Card, with the offense actions on the opposite side.

INFIELD POSITIONS

There are 5 different ways you can have your infield play: 1) normal, 2) double play depth, 3) guarding the lines, 4) in at the corners, and 5) in all around. Whatever option is selected will remain in effect until changed or until there are three outs.

Normal Infield (NI) usually is used whenever the bases are empty, there are two outs, or there is a runner on second only. It also may be used with less than two outs and a runner on third, if preventing the batter from getting a hit is more important than keeping the runner on third from scoring. NI is automatically selected at the start of each half-inning.

Double Play (DP) depth is where the secondbaseman and shortstop play slightly in and closer to second base. It increases the chances of making a double play with a runner on first, at the cost of increasing the chance of a ground ball going through the infield for a single. It normally is employed with a runner on first and less than two outs.

Guarding the Lines (GL) consists of moving the firstbaseman and the thirdbaseman closer to the foul line to guard against extra-base hits down the line. It is often employed late in a close game to decrease the likelihood of a double or triple, at the expense of a

somewhat greater increase in the likelihood of a ground ball single. The secondbaseman and shortstop will automatically play at double play depth if first base is occupied.

In at the Corners (IC) causes the firstbaseman and thirdbaseman to play in closer to home, and the secondbaseman and shortstop to play at double play depth. It is used to guard against bunts, and to improve the chances of a play at home with a runner on third. The price you pay is a significant increase in the chance of a ball hit to first or third going for a single. The secondbaseman and shortstop will try for a double play if there are runners on both first and third and less than two out.

Infield In (IN) is called when you want to try and make a play on a runner attempting to score from third on an infield ground ball. It has a better chance to succeed if the bases are loaded and there is a force play at home, than if either first or second is empty. The penalty is a greatly increased chance of a sharply hit ground ball going through the infield for a single.

OUTFIELD POSITIONS

There are two outfield positions available: 1) normal and 2) shallow.

Normal Outfield (NO) is used in the vast majority of defensive situations. It is automatically selected at the start of each half-inning.

Shallow Outfield (SO) typically is used only with a very weak hitter (such as a pitcher) at bat, or with the winning run on third in the last half of the last inning and less than 2 outs. In this latter case, you are trying to stop the short fly ball from falling in for a hit, and giving up on long fly balls which would probably be a sacrifice fly anyway.

HOLDING BASE RUNNERS

There are three different methods your team can use to hold runners on base – normal, loose or tight.

Hold Runners Normal (HN) is the standard method, and the one that is in effect at the start of each half-inning.

Hold Runners Loose (HL) is where your infielders will essentially play where they would be playing if the bases were empty, not trying to keep base runners close to their bases. This tactic is often employed with bases loaded, with slow runners on first or second, or with a substantial lead.

Hold Runners Tight (HT) involves having the firstbaseman stay on the bag with a runner on first, and the pitcher throw over often to keep the runner from getting too big a lead.

Other fielders also will play closer to their bases when there is a runner present. Pitch outs are assumed to occur on occasion, making it more difficult for a runner to steal, but also reducing the pitcher's effectiveness against the batter. Pick-offs also are more likely, as is the probability of throwing the ball away on a pick-off attempt. The HT tactic typically is employed when there is a good runner on first in a close game, a sacrifice bunt is anticipated, or the tying or winning run is on second base in the late innings.

PITCHING CHANGES AND STATUS CHECKS

Proper management of pitching resources is one of the primary keys to success for a baseball manager. You have the opportunity in COMPUTER BASEBALL to make many of the same pitching decisions faced by Major League managers. The two commands which are used to control the use of pitchers are Bull Pen Change (BP) and Visit the Mound (VM).

Bull Pen Change (BP) allows you to place one or two pitchers in the bull pen to warm up, bring a new pitcher into the game, or have a pitcher stop warming up. Relief pitchers will not be fully effective until they have been warming up or pitching while at least three batters have come to bat. The actual time needed to get ready varies for each pitcher according to the number of relief appearances and the average number of innings pitched per game; pitchers with many relief appearances and few innings pitched per game will warm up fastest. A visit to the mound, a change of pitchers and the break between innings each count as the equivalent of one batter for warm-up purposes. A pitcher who has previously warmed up during a game will warm up one batter faster. A pitcher who is fully warmed up will have a '+' in front of his name on the display. Keep in mind that extra time spent warming up in the bull pen causes a pitcher to tire sooner when he enters the game.

The BP command is also available to the offensive manager, with the added feature of his being able to determine how tired his pitcher is. On defense, this information can only be obtained through a visit to the mound, which is described next.

Visit the Mound (VM) is a defensive manager's option which has two possible purposes: to find out how tired his pitcher is, and to give his relief pitcher extra time to warm up. The manager will be told that his pitcher is either OK, tiring, or tired. The length of time a

pitcher can pitch before tiring is a function of the average number of innings pitched per game, and whether he is a starter or reliever. Pitchers steadily lose effectiveness while they are tiring, until they are able to be hit fairly easily when their status is shown as tired. Note that you only have one free visit to the mound per pitcher per inning; on the second visit you must change pitchers.

DEFENSIVE SUBSTITUTION

Change Players (CP) is the command which will permit you to insert new players into the defensive line-up, or change defensive players' positions. You will be shown the current line-up and then asked whether you are making a substitution or a position change. If making a substitution, the roster of available players will be presented to help in making your selection.

SAVING A GAME (PART II)

Save Game (SG) permits you to save the current status of a game so that it can be continued later. Apple and Commodore users may save a game at the start of every half inning, before a pitch is thrown. Atari users may save a game only at the top of an inning. A separate disk must be used to save the data. See SAVING A GAME (PART I) on page 2.

PITCHING TO THE BATTER

The defensive action phase is terminated by any of the following three methods of pitching to the batter: pitch, pitch around, or intentional walk.

Pitch is the standard command for the defense to use to pitch to the batter. This command can be selected simply by pressing 'RETURN'. (**APPLE** only: In the paddle mode of play, the command is P.)

Pitch Around (PA) is employed when you don't want to give a batter anything good to hit. The effect is to significantly increase the probability of walking the batter, while decreasing the likelihood of an extra-base hit.

Intentional Walk (IW) is used to deliberately send the batter to first base by pitching four straight balls.

OFFENSE ACTIONS

There are three types of unique actions available to the offensive team's manager, and two commands — Save Game (SG) and Bull Pen Change (BP) — which are available to both offense and defense. The SG and BP commands are described in the DEFENSE ACTIONS

section. The three offense command categories are: 1) selecting a base running strategy, 2) putting in a pinch hitter, and 3) choosing how you want the batter to hit the ball (hit away, hit and run, or bunt). Play will begin only when one of these hitting methods is selected, or when a stolen base is attempted.

BASE RUNNING

Base running strategies available to the offense are: normal, aggressive, and conservative. The offense may also order stolen bases to be attempted directly.

Run Normally (RN) is the standard base running option, and is automatically in effect at the start of each half-inning. Under this base running strategy, a steal of second occasionally will be attempted on their own by runners with a running rating of 7 or above. Advancing an extra base on a hit also will be attempted, but not very often, and only when there is a better than even chance of success.

Run Aggressively (RA) results in base runners taking more chances when running the bases. This strategy often is selected with 2 outs and a weak hitter on deck, or when tied or one run down late in a game. Runners with a running rating of 5 or greater may attempt to steal second on their own, with 8 or 9 rating runners stealing on their own about half of the time. All runners will be more aggressive about attempting to take an extra base on hits, or tagging up and trying to score on fly balls to the outfield.

Run Conservatively (RC) causes base runners to not take chances unless there is a very high probability of success. No base runners will attempt steals on their own. This strategy usually is chosen when you are several runs behind, and don't want to lose a big rally by having a base runner thrown out trying to steal or take an extra base.

Steal (ST) is used to have one or more base runners attempt to steal a base. With runners on first and third, a double steal will be attempted if the aggressive base running strategy is in effect. All other steal situations with more than one runner on base are automatically double or triple steals. Even though a steal is ordered, it is possible, particularly for runners with low running ratings, that the runner will not be able to get a jump on the pitcher, and the batter will hit away. As noted earlier, attempts to steal second base also can occur on the runner's own initiative. Steals of home have a very low probability of success, and should only be attempted by a runner with a very high running rating.

PINCH HITTERS AND PINCH RUNNERS

Pinch Hitter (PH) gives you the option of having one of your players on the bench replace the scheduled batter. You will be shown the roster of available reserves, including pitchers, from which to select your pinch hitter. If you pinch hit for your pitcher, you will automatically be given a Bull Pen Change command at the completion of the half-inning, so that you can enter a new pitcher. You will be given the opportunity to leave a pinch hitter in the game, and by doing so it is possible to make a multiple substitution. The defensive manager gets another command entry opportunity following the naming of a pinch hitter or a pinch runner.

Pinch Runner (PR) is used to have someone on the bench replace one of your base runners. You will be shown the list of available players and the name and running rating of each base runner, then asked to name the pinch runner and which base he is going to (if more than one runner is on base). Pitchers cannot be used as pinch runners. As with pinch-hitting, you will be given an opportunity to leave the pinch runner in the game.

HIT, HIT AND RUN, AND BUNT

Any of the following three commands will cause the ball to be put in play, thus ending the offense decision phase.

Hit is the usual method of ending the offense action selection phase. It can be selected by simply pressing 'RETURN'. (**APPLE only:** In the paddle mode of play, the command is H.)

Hit and Run (HR) may be employed with a runner on first or runners on first and third. The runner attempts to steal second, while the batter tries to hit the ball through the hole left by the fielder who is covering second on the steal. It can be effective at breaking up ground ball double plays, but the runner may be doubled off on a line drive. The batter also can swing and miss, in which case the play is treated as a normal steal attempt.

Bunt (BU) is a command which can be given for a sacrifice or squeeze play attempt, or to try for a base hit. A bunt with the bases empty is always considered to be a bunt for a base hit, as is a bunt with a runner on second, third, or second and third, if conservative base running is in effect. A bunt with a runner on third and normal base running will result in a "safety" squeeze, but will be a "suicide" squeeze if used with aggressive base running. Bunts with runners on first, or first and second, are

always considered sacrifice attempts. A bunt has the greatest chance of success with the infield back in its normal position, and least effective with infielders playing in. Each batter's bunting ability is calculated from his running rating, batting average, and percentage of singles. One possible outcome of a bunt attempt is that the batter is initially unsuccessful and now has two strikes on him. In this case, you will be given the opportunity to continue the bunt attempt, or to change and have the batter hit away (in either case the batter has an increased probability of striking out).

ACTIONS COMMON TO OFFENSE AND DEFENSE

The offensive manager also may select the Save Game (SG) and Bull Pen Change (BP) commands which are described in the previous section on DEFENSE ACTIONS.

SOLITAIRE PLAY

If you are in need of an opponent and no one is around, Casey, the computer baseball manager, will be glad to take you on. Simply select option 1 on the Start-Up menu, and Casey will be called on to make the managerial decisions for whichever team you indicate. Of course, as experienced table-top gamers are aware, it also is possible to play a game while making the decisions for both teams yourself.

Casey will select a starting line-up of his own, or you can enter one for him, if you prefer. It is also possible to indicate players which are not available due to injury or other reasons. During the play of the game, Casey's decisions will be indicated on the field display or in the text region below the display, whenever they would normally be known to an opponent.

INJURIES AND PLAYER EJECTIONS

It is possible for a player to be injured and forced to leave a game. The computer will specify the player injured. For those playing a multiple game series or a season, the computer will give the number of games the player must sit out before being available for use. Players must keep track of multiple game injuries themselves (i.e., the computer will not keep track of injuries from game to game). It is also possible for a player to be ejected from a game for arguing with the umpire. If a player is forced out of a game by either injury or ejection, the computer will ask for a substitute player.

ENTERING AND REVISING TEAM DATA

Twenty-eight Major League teams, opponents in 14 of the classic World Series encounters of the past, are provided on the COMPUTER BASEBALL game disk. A disk containing all of the Major League teams from the most recent season will be available by mail from SSI, within 6 months after the baseball season ends

Option 3 on the Start-Up menu provides the option of entering and saving player data for any team — from Little League to an All-Time All-Star Major League squad. Option 4 allows you to review and revise the entries for an existing team. This feature permits the correction of erroneous entries, the trading of players, or the modification of actual player statistics to explore "What if?" possibilities. Team data files generated by using options 3 or 4 must be stored on a separate disk. See SAVING A GAME (PART I) for instructions on preparing the disk. Team names consist of a nickname (**APPLE or COMMODORE 64:** maximum of 10 letters. **ATARI:** maximum of 8 letters) and a modifier (**APPLE or COMMODORE 64:** maximum of 5 letters; **ATARI:** maximum of 2 letters) such as the year, separated by a dash ('-'). Therefore, the '-' symbol may not be used in either the nickname or the modifier.

When entering data for a new team, you will be prompted for each data entry required. For pitchers, this data consists of: wins, losses, games, games started, complete games, innings pitched, hits against, walks, strikeouts, earned run average, fielding rating, batting rating, and whether he throws right or left handed. Procedures for estimating the fielding and batting ratings are discussed in the following sections. The maximum number of pitchers on a team is 10.

Data required for each batter is: games, at bats, hits, doubles, triples, home runs, runs, SBI's, walks, strikeouts, stolen bases, batting stance (right, left or switch hitter), and position-fielding rating combinations for up to four different positions. Outfielders may be rated either at one or more specific positions, or be given a general 'OF' rating. An OF rating applies only when playing LF or RF; it will be reduced by 2 if the player is used in CF. The maximum number of non-pitchers on a team is 15.

NOTE: A player's first or last name has a maximum of 12 characters (APPLE or ATARI) or 10 characters (COMMODORE 64).

FIELDING RATING

Each player is assigned a **fielding rating** (FR) for each position he plays, up to a maximum of four positions. Values for FR range from 1 (worst) to 9 (best), and indicate a fielder's approximate overall fielding ability at a given position. Fielding ratings are based primarily on fielding percentage, but also should take into account other factors, such as throwing arm for an outfielder or catcher, or range for an infielder. In general, a 5 rating is average for a Major League player, a 9 signifies a Golden Glove winner, and a 1 rating applies to someone who has not played that particular position very often or very well. A fielder used at a position for which he does not have a rating will be assigned a rating of 1.

The following formulas may be used to obtain an approximate FR value based solely on fielding percentage. Remember that fielding percentages can be deceiving indicators for players who did not play very many games at a position, so don't give a 9 rating just because someone happened to play one or two games at a position without an error.

FR	Pitcher	Catcher	Firstbaseman
1	.000-.869	.000-.955	.000-.970
2	.870-.894	.956-.964	.971-.976
3	.895-.909	.965-.971	.977-.980
4	.910-.924	.972-.976	.981-.984
5	.925-.939	.977-.981	.985-.987
6	.940-.954	.982-.986	.988-.990
7	.955-.969	.987-.991	.991-.993
8	.970-.984	.992-.995	.994-.996
9	.985-.999	.996-.999	.997-.999

FR	2B	3B, SS	Outfielder
1	.000-.925	.000-.917	.000-.935
2	.926-.935	.918-.927	.936-.943
3	.936-.945	.928-.937	.944-.951
4	.946-.955	.938-.947	.952-.959
5	.956-.963	.948-.957	.960-.967
6	.964-.971	.956-.963	.968-.975
7	.972-.979	.964-.971	.976-.983
8	.980-.987	.972-.979	.984-.991
9	.988-.999	.980-.999	.992-.999

PITCHERS BATTING RATING

The approximate batting ability of pitchers is represented by the **Pitchers Batting Rating** (PBR), which, like FR, is a number from 1 to 9. This number is related most closely to batting average, but also reflects increased power with increasing values of PBR. A formula which can

be used to estimate PBR is:

$$PBR = \{1 + 30 \star BA\}$$

where BA is batting average and { } indicates reduction of the result to an integer. Since the maximum PBR value is 9, pitchers hitting .300 or above will all have a PBR value of 9. You might consider adding 1 to a PBR rating for pitchers with more than one-third of their hits for extra bases.

RUNNING RATING

A running rating value of 1 to 9 is computed for each player by the program. This rating is based primarily on the ratio of stolen bases to times on base from a single or a walk. The player's primary defensive position is also considered in the computation. A rating of 9 represents a runner with a high percentage of stolen bases per opportunity, while a 1 rating is normally assigned to a catcher with no steals or a weak-hitting pitcher.

MODEL DESIGN

COMPUTER BASEBALL is a sophisticated probabilistic simulation of the game of baseball. Each aspect of the possible interactions that can occur on a baseball diamond is modelled by formulas relating the probability of various outcomes to the performance records of the players involved. The principal interaction is between the pitcher and the batter, and this is the most elaborate of the individual models. The two components of the pitcher-batter interaction are termed Pitcher Effectiveness and Batter Effectiveness, and these are discussed briefly in the following sections.

PITCHER EFFECTIVENESS

Pitching plays the dominant role in determining the outcome of the pitcher-batter interaction, just as it does in actual baseball. The fundamental effectiveness of a pitcher is based on the ratio of hits against to the approximate number of batters faced (hits plus walks plus outs). A pitcher's ERA, number of wins and winning percentage also influence total pitcher effectiveness, particularly with runners on base. Walk and wild pitch probabilities are based on the average number of walks per innings pitched, while strikeout probabilities are directly related to strikeouts per inning.

Simulation of how soon a pitcher will begin tiring is based on a starting pitcher's ratio of complete games to games started, and the average number of innings pitched per appearance for both starters and relievers. A random

factor is included also, so that a pitcher will tire earlier in some games and later in others. If the "days since last pitched" option is used, the formulas used for determining if a pitcher is fully rested are:

$$DR = \{1 + SQR(3 \star IP/4)\} \quad \text{(Starters)}$$
$$DR = \{SQR(4 \star IP) - 2\}) \quad \text{(Relievers)}$$

where DR is number of days rest needed, IP is number of innings pitched, and SQR stands for square root.

BATTER EFFECTIVENESS

Each batter's effectiveness is derived from the ratios of the number of hits, home runs, walks, etc., to the number of times at bat. The effects of batting against right-handed or left-handed pitchers is another important factor; batters do better when batting against a pitcher who throws opposite to the way they bat. The ratio of RBI's to total at bats is considered when runners are in scoring position, so that batters who drive in a high percentage of runs are more effective in these situations. A batter's running rating is used in determining such things as the likelihood of grounding into a double play.

EFFECTS OF MANAGERS' DECISIONS

A fundamental consideration in the design of COMPUTER BASEBALL was to permit each team's manager to become involved as much as possible in determining the outcome of the game through the decisions he makes. The equations used to compute the outcome probabilities of almost every play make extensive use of the various items which are under the manager's control, such as infield position and base-running aggressiveness. The game will also play reasonably well (though not as realistically) if the base running, hold runners or infield position manager's options are not used.

DESIGNER'S NOTES

The development of COMPUTER BASE-BALL involved a continuing battle between the desire for more realism, more options and more unusual outcomes on the one hand, and the limitations of available computer memory on the other. There were many things that we would like to have included, such as the effects of different ball parks, or the inclusion of more data on each player, but the practical limitations of computer memory size intervened. As it currently exists, the program is segmented into three parts, each of which almost fills the

available memory space when running.

One of the big advantages of a computer-based baseball strategy game over table-top board games is the number of different factors that can be considered in determining each outcome on the field. The effects of as many separate factors as possible were included in computing the probabilities for the results of each play. Some of these have been mentioned in the descriptions of the offense and defense actions, and in the section on MODEL DESIGN, but many more interaction effects are included in the game design than are mentioned in this rules manual. The whole intent of the game design has been to create a game which plays as much like real baseball as possible, yet is entertaining and fun to play on a computer. The use of the animated graphics of each play on the field is a compromise between providing

information about what is happening on the field in an entertaining way, without using up too much computer time or memory.

The selection of the teams to include with the game was a difficult decision. The solution arrived at was to include a set of famous World Series teams from the past with the standard game, and then provide by mail a new team disk with the teams from the most recent Major League season each year. This way, no one will buy a game with "out-of-date" teams. If you don't want to buy a separate team data disk, you can always enter data for the current year's teams yourself.

Designing COMPUTER BASEBALL was a lot of fun, and play testing it was even more so. We hope you get as much enjoyment from playing it as we had in developing it.

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