



Orbital Defender

by **Scott Williams**
and the HCM Staff

*As you seem to hang in the heavens,
Earth hangs its hopes on you.
With only a split-second's warning,
will you recognize the enemy?*

Friend or Foe? As a lonely guard stands ready, this is always the bottom line. True of sentries everywhere, at all times, this question now presses on the entire planet—and you are all that stands between Mother Earth and the invading hordes from outer space. *Orbital Defender* is a game based on reflexes and hand-eye coordination—placing you in command of a patrol ship orbiting Earth. Your mission is to recognize and destroy any hostile ship approaching the planet, but to let friendly ships pass unharmed. Your enemies are the Sandian hordes, and the space pirates from Alpha II. Traffic is heavy, and you have to make instant decisions; or, you may unwittingly miss a target, destroy an ally, or possibly be shot down yourself!

Think Fast

As Planet Earth slides slowly beneath, and the stars appear to rise over a curved horizon, you fly a lonely and dangerous vigil. Your ship is armed with a short-range particle-beam discharge cannon. A radar scope in your control panel homes in on any passing spacecraft and displays its shape. It is your decision to fire or not—and it must be a split-second judgement: friendly or hostile? Before you see the craft on the screen, a warning light and alarm brings you to attention. If you recognize the ship as an enemy, press the [SPACE BAR] to fire. Your ship's computer locks in the target, but you must decide who's who. Earth law declares that only a human being—not a computer—will decide whether life is to be taken in defense of the planet. You'll be awarded points

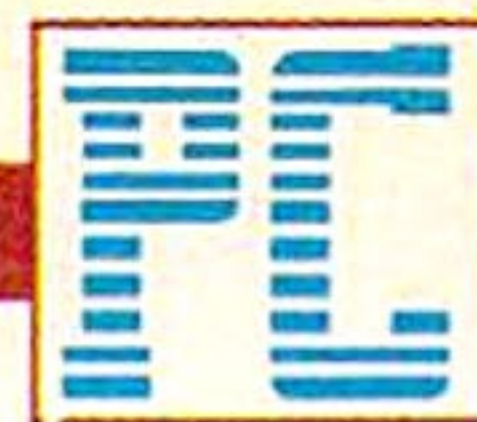
for every enemy you shoot, but docked for each Earth ship that you mistakenly destroy.

Your ship's instrument panel is an active one, displaying several factors important to your survival and success. Three sliding scales indicate thrust, your shield strength (if an attack catches you with your shields down, you're dead), and dock time—the time left before your ship reaches an Earth base satellite. Three information displays show the class, type, and firing range of any ship on the radar screen, and a fourth sliding scale shows the level of energy remaining in your ship.

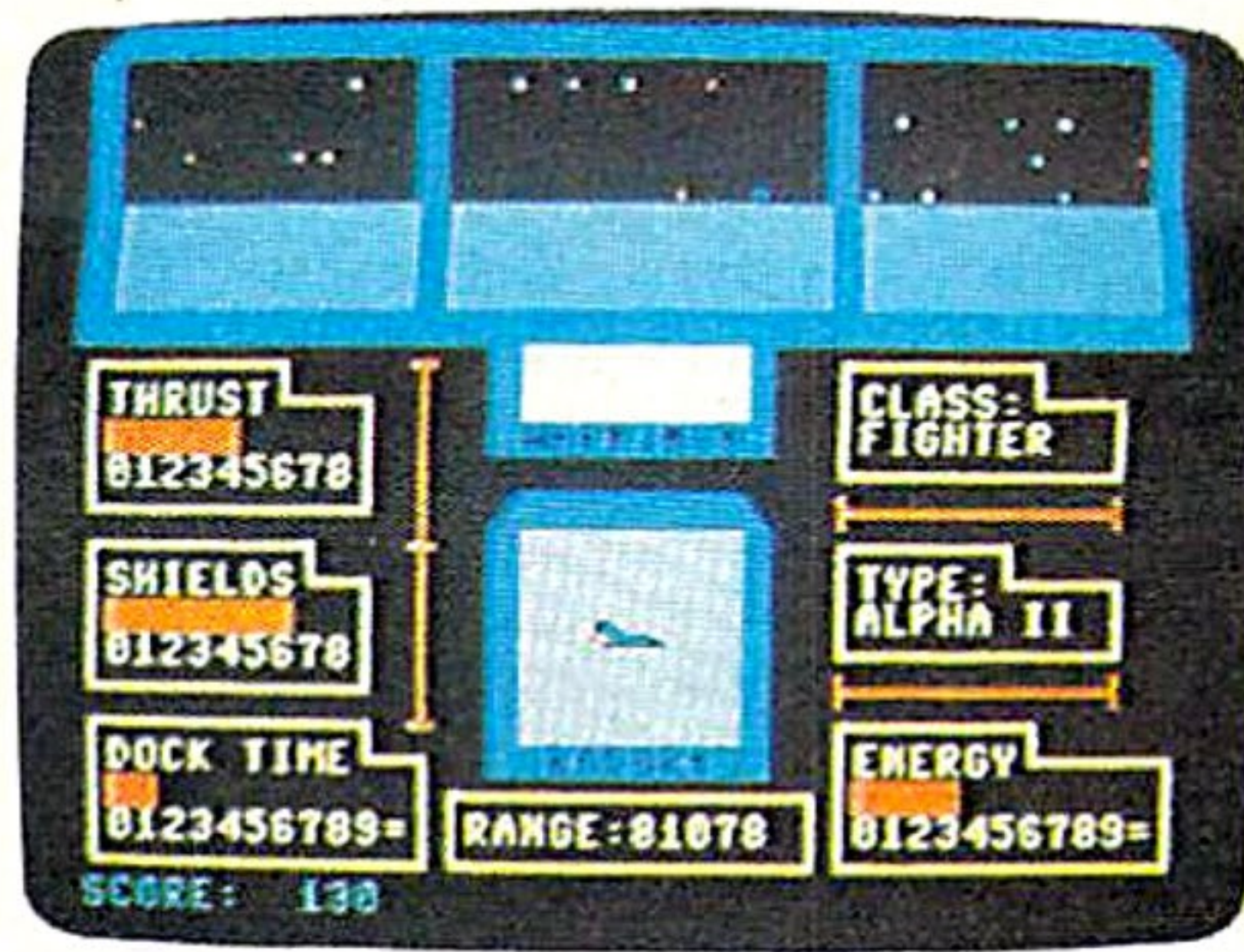
Energy and Skill

Your thruster, shields, and cannon all consume energy—running out of energy makes you a perfect target for the Sandians or Alpha II pirates. The only way to get more energy is to dock with an Earth base, which is easy—as long as you don't blow *it* out of the universe. If your itchy trigger finger destroys the base before you get there, you'll have to conserve energy until the next dock. You can, for example, turn off your shields to conserve, but you will have to shoot perfectly to survive until you can reach the next base. If you shoot more than 6 Earth ships though, you will not be allowed to dock with an Earth base for the rest of the game.

From the first menu, you can choose 10 different skill levels, ranging from Rookie Cadet to Commander. Skill levels vary according to how much time you have to react before firing or taking a blow. The program keeps track



A representative photo of *Orbital Defender* taken from the Commodore 64 screen.



“Earth law declares that only a human being—not a computer—will decide whether life is to be taken . . .”

of how many ships of what type are destroyed, and it displays this along with your score at the end of the game.

Now sit down at the controls and do your best to defend our Mother Planet. Just be sure to stay on your toes, and—before you fire—remember to ask, *Friend or Foe?*

For your key-in listing see HCM PROGRAM LISTINGS Contents.



CONTROL CAPSULE *Orbital Defender*

KEY	FUNCTION
Space Bar	Fire
A	Increase Thrust
Z	Decrease Thrust
S	Raise Shields
X	Lower Shields

The Apple version of this program uses four assembly language routines. These routines control sound effects, character graphics, and two other very interesting functions: shape expansion and page switching. In the shape-expansion routine, the program takes a small shape from the shape table and enlarges it on the screen. The page-switching routine rapidly switches between two screens stored separately on high-resolution graphics Pages 1 and 2. (For more on these graphics pages, see the Apple “Tech Note” in this issue, on page 60.) The list below shows the line number where the data statements for each routine are located:

Routine	Data Line Nos.
1. Char. Graphics	1230-1240
2. Sound	1240
3. Page Move	1240-1250
4. Shape Expansion	1250-1280

The call addresses for each routine are all listed in lines 250 and 260 of the program:

```

250 PAUSE = 30:NS = 25:P1 = 32:P2 =
    64:BASE = 2048:DIM XS(NS),
    YS(NS):FX(1) = 39:FX(2)
    = 139:FX(3) = 239:C(1) = 2:C(2) =
    5:C(3) = 6:C(4) = 0
260 HCHAR = BASE:SOUND = BASE + 55:SPKR
    = BASE + 67:MOVE = BASE + 75:OUT =
    BASE + 115:TABLE = BASE
    + 300:SHPTB = 768

```

Line 250 sets the base address for all the routines in memory, and line 260 defines each address relative to the base. When one of these routines is called by the program, a parameter is passed to the machine language routine, causing the routine to run in a certain way (depending on the value of the parameter). For example, line 790 calls the sound routine with a parameter value of 255, creating a sound for approximately 1/4 second, starting with a high pitch and decreasing. If you change this value to 63, it will create several fast oscillations from high to low pitch. Try it. If you wish, you may try other values in this parameter, or find new lines in which other routines are called, and change their parameters—just to see what happens. Or try this: After running the program, the sound routine remains in memory. Halt the program and enter the following line:

```

FOR Z = 0 TO 255:HOME:PRINT Z:CALL SOUND, Z:
FOR TD = 1 TO 1500:NEXT:NEXT

```

Now as you change values in the sound parameter, you will hear the immediate results.



CONTROL CAPSULE *Orbital Defender*

KEY	FUNCTION
Space Bar	Fire
T	Increase Thrust
Shift T	Decrease Thrust
S	Raise Shields
Shift S	Lower Shields

Although the Commodore 64 provides 8 different sprites, all of which can be used simultaneously, this program uses only one sprite—which it redefines to get all 9 different shapes of the hostile and friendly crafts displayed on the radar screen. Because it displays only one shape at a time, the program avoids having to redefine more than one sprite. Line 1430 sets an offset that determines which shape will be POKED to the sprite. Line 1440 POKES the shape data to the sprite from a shape table stored in memory. Data for the shapes are in separate data statements at the end of the program.

Continued on next page.

CONTROL CAPSULE *Orbital Defender*

KEY	FUNCTION
Space Bar	Fire
Cursor Up	Increase Thrust
Cursor Down	Decrease Thrust
Cursor Left	Lower Shields
Cursor Right	Raise Shields

This version uses IBM's GET and PUT commands to generate changes in the graphics screen. The GET command allows the program to grab a rectangular section of the screen and save it to an array. (Two parameters define the rectangle by the position of its upper left- and lower right-hand corners.) The PUT command allows you to place graphics stored with the GET command back on the screen.

The use of GET and PUT allows simple animation. Several options can be used with the PUT command to determine how the image will be placed on the screen. In this program, we use the PSET when displaying ships on the radar, which will place the entire image back just as it was when we grabbed it with GET. Then we use the LINE command to erase the radar image. The BF (Box Fill) option is used with a black background color—a very fast and effective way to erase controlled areas of the screen.

Orbital Defender (Apple II Family) Explanation of the Program.

Line Nos.	Explanation
100-200	Program header.
210-270	Initialize program.
280-290	Display title screen.
300-350	Read program data for shapes.
360-370	Start sound routine.
380-390	Get skill level.
400-530	Display playing screen.
540-700	Main control loop.
710-870	Radar picks up a ship.
880-940	End of game routine.
950-1010	Dock with Earth base.
1020-1050	Radar display routine.
1060-1290	Program data.
1300	Error routine.

Orbital Defender (C-64) Explanation of the Program.

Line Nos.	Explanation
100-180	Program header.
190-260	Display title screen.
270-520	Initialize program.
530-630	Display level option menu.
640-880	Display the playing screen.
890-1050	Main control loop.
1060-1120	Scroll stars.
1130-1160	Scroll the Earth.
1170-1570	Radar picked up a ship.
1580-1640	Read keyboard for controls.
1650-1770	End-of-game routine.
1780-1930	Dock with Earth base.
1940-2930	Program data.
2940-2980	Sound data.



CONTROL CAPSULE *Orbital Defender*

KEY	FUNCTION
Space Bar	Fire
E	Increase Thrust
X	Decrease Thrust
D	Raise Shields
S	Lower Shields

[Note: This program has been converted from the original in Extended BASIC to a BASIC version. To conserve space, we are publishing only the BASIC version in this issue of the magazine. However, the Extended BASIC program will be included with the BASIC program on our disk and cassette media service (ON DISK and ON TAPE) for Vol. 5, No. 1.]

The most significant aspect of the TI version of *Orbital Defender* is its use of the CALL COLOR command to enhance graphics. With CALL COLOR, the program can "hide" parts of the graphics screen until they are needed to create certain effects. This is very helpful in creating the illusion that extensive graphics are being rapidly and simultaneously written to the screen when, in fact, they were there all the time.

Orbital Defender (IBM PC and IBM PCjr) Explanation of the Program.

Line Nos.	Explanation
100-220	Program header.
230-350	Initialize program and graphics.
360-440	Main control loop.
450-630	Display title screen.
640-710	Display playing screen.
720-760	Flash warning light.
770-970	Display controls.
980-1160	Rotate the Earth.
1170-1190	Input skill level.
1200-1250	Update controls.
1260-1460	Main control loop.
1470-1700	Sound and graphics routines for lasers and blasts.
1710-1790	End of game. Option to play again.

Orbital Defender (TI-99/4A) Explanation of the Program.

Line Nos.	Explanation
100-180	Program header.
190-230	Initialize program.
240-250	Branch to display level option.
260-340	Display playing-screen control panel.
350-420	Main control loop.
430-480	Routine to scroll the earth.
490-890	Radar picked up a ship.
900-990	Read keyboard for controls.
1000-1040	End of game—option to play again.
1050-1160	Dock with Earth base.
1170	Display screen-graphics routine.
1180-1630	Program data.
1640-1680	End of game data for display.

HCM