

```

490 IF A$="{RIGHT}" THEN A=A+1:B=B+1
500 IF A$="{DOWN}" THEN A=A-1:B=B-1
510 IF A<7680 THEN A=A+22:B=B+22
520 IF A>8163 THEN A=A-22:B=B-22
530 POKE E,42:POKE F,0
540 FOR I=1 TO 50:NEXT
550 IF E>8163 THEN GOTO 760
560 IF A=ETHEN 580
570 E=E+22:F=F+22:PRINT "{CLEAR}":GOTO450
580 GET B$
590 IF B$=" " THEN 620
600 GOTO 570
610 REM BOMB IS DESTROYED
620 X=100:FOR I=1 TO 10:POKEE,X
630 POKE F,0
640 POKEE+21,X
650 POKEF+21,0
660 POKEE+24,X
670 POKEF+24,0
680 X=X+1
690 NEXT
700 NO=210:S1=-3:DU=60:GOSUB 960
710 P=P+1
720 Q=Q+22-INT((A-7680)/22)
730 A=A-22:B=B-22
740 GOTO380
750 REM BOMB GETS YOU!
760 POKE E,32:FOR I=1 TO 5
770 POKEE-I,188
780 POKEF-I,0
790 POKEE+I,190
800 POKEF+I,0
810 FOR S=1 TO 50:NEXT
820 NEXT
830 M=M+1
840 NO=135:S1=-2:DU=100:GOSUB 960
850 GOTO380
860 PRINT "{CLEAR}{DOWN} GAME OVER"
870 PRINT "{03 DOWN} DESTROYED" P
880 PRINT "{02 DOWN} MISSED" M
890 PRINT "{02 DOWN} TOTAL POINTS" P*Q*10
900 FOR I=1 TO 30:GET D$:NEXT I
910 PRINT "{04 DOWN} PRESS {REV} P{OFF} TO PL
    AY AGAIN"
920 GET D$:IF D$="" THEN 920
930 IF D$="P" THEN 110
940 END
950 REM EXPLOSIONS
960 POKE 36877,NO
970 FOR I=15 TO 1 STEP S1
980 POKE 36878,I
990 FOR DELAY=1 TO DU:NEXT DELAY:NEXT I
1000 POKE 36877,0:POKE 36878,0
1010 RETURN

```

Atari Notes

Program 2 will run on any 16K Atari 400/800. Protect your multicolored city (designed by Harry Blair, **COMPUTE!**'s illustrator) from falling bombs. Move the crosshair with your joystick to intercept the bomb before it lands. You receive more points the higher up on the screen you intercept the bomb. The game ends when the city is finally pulverized.

A Velocity Stick

You'll probably notice that joystick response is a

little odd. When you move it just a bit, your crosshair moves finely. But when you continue pressing it in a certain direction, the crosshair really takes off. This type of joystick response is called a *velocity stick*, or more accurately, an *acceleration stick*.

A velocity stick lets the player have fine control over his marker, but automatically speeds up response when the stick is pushed long enough. It's like the gas pedal in a car. A true acceleration stick would also coast a while when you let go, but not in Air Defense.

This game was an experiment of sorts. Among the novelties are realistic multicolored characters in IRG mode 5 (see the Atari Notes for "Thunderbird," **COMPUTE!**, January 1983, #32), and a multicolor player (the airplane) formed by overlaying two players to get three colors.

Of course, some machine language is necessary to move player/missile graphics (unless you use strings). A small routine moves players zero and one (the airplane) in tandem. BASIC is too slow to use two POKES without some flicker. The other routines are more interesting. QUIKMOVE moves a series of bytes from one position to another. It is used here to move the shapes for the explosion (stored in the character set) into player four. It can only move up to 255 bytes.

PMG ML Routine

PMOVE is responsible for moving a player any number of spaces up or down. It does this by "scrolling" the player memory strip the number of specified times. It can move the player down the screen as many as 127 times, and move it up by adding 128 to the number of moves you want to go up (it makes more sense in machine language). It will only move the player vertically; and, if you move too much, the player will disappear (a good way to clear out a player is to move it 0 bytes, which is really 128 bytes). It's used in Air Defense to move the crosshair.

The syntax for SPOKE (Simultaneous POKE) is:

XX=USR(1719,N)

N is the new horizontal position of players zero and one.

The syntax for QUIKMOVE is:

XX=USR(1729,FROM,TO,LENGTH)
FROM = source address,
TO = destination address, and
LENGTH = number of bytes to move.

The syntax for PMOVE is:

XX=USR(1664,ADR,N)

N is either 1-127 to move the player down, or 129-255 ((1 - 127) + 128) to move the player up. ADR is the address of the player's first byte (player zero would be PMBASE + 512 in double-resolution).