place with a constant temperature to insure the fidelity of the disk.

Known problems with High Gravity: There are no known programming errors in **High Gravity**, but there is one logical error that effects the program's accuracy as a simulation. A number of saved configurations (namely RBIGSWING, RFASTSWING and RSWINGPREC) demonstrate something that is impossible in nature - namely a swinging orbit. This is an error in the mathematics of the program (and the reasons for this error are unexplainable in the context of the equations used). However, this is an interesting phenomenon, and examples are provided. This does not otherwise effect the accuracy of the program in any way

Disclaimer: Asgard Software extends no warranty for **High Gravity** beyond the physical part consisting of the program diskettes itself. Asgard Software does not warrant that the program will perform as stated, be free from error, or meet the needs of the user in any capacity. Asgard Software is not liable for damage incurred by the use or misuse of this product resulting from proper or improper treatment.

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Asgard Software, PO Box 10306, Rockville, MD 20850

High Gravity

By Tom Wible

In short, **High Gravity** is a sophisticated simulation of space flight that is both entertaining and educational. It is an ideal teacher for the physics student (of all levels), and an ideal game for all ages. It is simple to use and fully documented. It requires the Editor/Assembler module, 32 K and a disk system. Available for only $14.95.

Asgard Software

High Gravity

By Tom Wible

Introduction: As your shuttle sails through the empty reaches of unexplored space your display screens begin to tell the story. Your radar has detected the crippled space station - this lonely outpost that represents one of mankind's first fitful steps from mother Earth.

You now see the wisdom of your superiors decision to outfit your ship with 10 re-supply rockets. The space station is clearly trapped deep in the middle of what must be one of the strangest solar systems that has been found in the nearly 100 years of space exploration. The planets are packed closely together and have the same orbit in relation to the system's sun - in other words they seemingly stand still in space. This is the reason the space station is here, to explore this unique physics laboratory of nature, and ultimately your reason for being here as well.

Your computer reveals that the multitude of competing gravity fields creates an area that would be distinctly unhealthy for your space shuttle. There is only one answer, only one thing that will stave off starvation on the space station until more help can arrive from your light-years distant base. You must fire your supply rockets to the station, without the help of your thoroughly befuddled computer no less! You must use human instinct where the mathematical precision of your computer fails. Good luck, the lives of the scientists on the space station depend on it.

Description: **High Gravity** is both an educational and an entertainment program. For users interested in it's educational aspects, see the section called 'High Gravity and Physics' for more information. User's more interested in it's entertainment potential should see the section entitled 'Playing High Gravity' for detailed instructions.

Program Requirements: **High Gravity** requires a disk

system, at least 32K of memory, a joystick, and either the Editor/Assembler or Mini-Memory modules.

Loading High Gravity: **High Gravity** may be loaded through either the Editor/Assembler or Mini-Memory modules. The method of loading is somewhat the same for each:

Through Editor/Assembler

1. Place the module in the console with the power turned off.
2. Turn on all peripherals, and then the console.
3. Select the module from the main menu.
4. Select Option #5, "Load Program File" and press <ENTER> at the promot.
5. The program will automatically load and run.

Through Mini-Memory

1. Repeat steps one to three fropm above.
3. Select Option #3, "Load Program File" and press <ENTER> at the prompt.
3. The program will automatically load and run.

Playing High Gravity: The game of **High Gravity** is an interactive strategy game whose premise is so simple, yet so challenging, that it is nearly addictive - much like checkers or poker.

After the program loads you will be faced with a description screen displaying the immediate object of the game. At this point you must press the firing button on your joystick you will be using. The screen will clear, and a list of the commands and options of **High Gravity** will be displayed. Most of these options, described below in the section entitled 'High Gravity and Physics', are not needed just to play the game. To start the game, press any key at this screen.

The game screen consists of a number of planets from 1 to 9 (the default is 9 but alterable for the next game by

pressing "P" during the game and entering a new number), an 'X' shaped space station, a small shuttle roughly opposite, and a cursor. This cursor is controlled by the joystick, and is the firing guide for the re-supply rockets. Merely aim the cursor in the direction you wish to fire, and press the firing button on the joystick to fire the rocket. The path of the rocket will be traced by a blinking trail of dots. The amount of blinking may be changed any time during a game by pressing "W", and entering a number between 0 and 10 (where 0 represents no blinking). The program will report what happens to the rocket in the upper left corner.

Another key that is important to gameplay is the "I" key, which enables you to change the initial velocity of the rocket (from 1 to 20). This key permits you to change the firing speed of the rocket. It follows that the faster the rocket is going, the less the influence the planets will have on the rocket's flight. This key has an immediate effect during a game, unlike the "P" key.

If at any time you wish to stop the game before running out of re-supply capsules (or before winning), you can simply press "A" for 'Abort Mission'. If you win the game by successfully firing a re-supply capsule to the space station, or if you aborted the mission, a small menu will appear with 5 options; "Y", "N", "S", "R", and "W". These mean the following:

"Y" - 'Yes': Randomly redraw the solar system and play another game.
"N" - 'No': Do not play another game, quit back to the loading module.
"S" - 'Start Over': Re-start the same game over again with the solar system the same as before.
"R" - 'Recall': Recall saved game from disk.
"W" - 'Write': Write, or save current game on disk.

In order to load or save a game from the start you must abort the first game to get to this menu. For more information on saving and restoring games, see the section entitled 'Saving and Loading Solar Systems'. On pressing "Y" at the end-of-game menu, the solar system will be

redrawn to the parameters that you changed; hence if you changed the number of planets from 9 to 2 the next game would only have 2 planets in the solar system. If you would like to change the parameters when you first start the program, you may wish to immediately make your changes, abort the current game, and start a new one from scratch by pressing "Y" at the menu.

<u>High Gravity and Physics:</u> For the teacher or student, **High Gravity** is a veritable physics laboratory inside your computer. It readily demonstrates some of the most important concepts taught in elementary physics, such as velocity and acceleration due to gravity. **High Gravity** is such an accurate simulation of space travel that young children using it will intuitively understand these concepts years before actually encountering them in a formal environment, providing them a head start above their classmates.

Some of the features of **High Gravity** contribute to it's use in the formal or informal educational environment. These features are pre-set by the program, but may be easily set during the course of the game, and any changes to these parameters of the game are automatically stored if the game is saved (see section below). The keys that allow you to set the variables of the simulation and their functions are described below:

"I", 'Initial Velocity': (default=5) This option is used to set the initial velocity of the projectile (or re-supply rocket). This factor can be set for any speed between 1 and 20, and is useful for demonstrating how on one hand a projectile has insufficiant velocity to escape from the region of a large body, and how on the other it does, thus engendering the concept of escape velocity.

"R", 'Density': (default=100) This factor, when used in conjunction with the initial velocity factor, further demonstrates the concept of escape velocity. By altering the relative densities of the planets (from anywhere between 1

and 3200), the effect of a heavier mass on the flight of a projectile is easily demonstrated.

"S", 'Scale Factor': (default=10) This option is used to set the relative scale of the planets (and hence their mass depending on their density), and can be set between 1 and 128.

"H", 'Hyperspace': (default=0) This option is used to easily demonstrate the effect of a single point gravity field on the flight of a projectile. Setting this factor to 1 makes the planets invisible to the projectile in all but it's gravitational effect. Hence the projectile will pass immediately through it. A factor of 2 means the projectile will also pass through the shuttle. This can be used to demonstrate that a foci of a parabolic orbit can be inside a planet.

"W", 'Wink Rate': (default=2) This factor enables you to set the speed of the simulation. A minimum value of 0 indicates makes the simulation proceeds quickly, and a maximum of 10 slows it down to a crawl.

"D", 'Debug Mode': (default=0) When the program is set to 'debug mode' (by setting this factor from 1-5), the path of the projectile, and the actual numbers that the program generates can be tracked on the screen. This is useful in demonstrating the numbers significance to reality.

"P", 'Planets': (default=3) Anywhere from 1 to 9 planets can be selected for the size of the solar system. A small number is useful for setting up special cases such as planetary orbits.

"K", 'Dark Star': (default=0) If this factor is set to 1, an unknown gravitational force will be placed off screen. This is useful in demonstrating the effect that additional gravity wells have on the dynamics of the flight of a projectile.

"C", 'Capsules': (default=10) This lets you have anywhere from 1 to 20 projectiles in a single game.

"T", 'Planet Seperation': (default=50) Setting this variable allows you to change the physical spacing of the randomly placed planets from between 20 and/100 pixils on the screen.

High Gravity can be set up to simulate virtually any gravitational situation. Due to the interactive nature of this simulation, the program can be readily "programmed" as well.

Saving and Loading Solar Systems: Two options are available for the express purpose of saving and loading game setups. These options are useful for creating a simulation for educational purposes, or merely for saving a neat game to show to a friend.

Both of these options are available through the menu presented at the end of the game, or when one is aborted. To load a saved configuration, simply press "R" at the menu, and the program will prompt you to enter the filename of the saved configuration. A number of 'sample configurations are provided on the program disk; their filenames are as follows:

```
RBIGSWING  RBLACKHOLE RFASTSWIN  RFIGURE8   RFIGURE8/1
RFIGURE8/2 RFIGURE8/3 RFIGURE8/4 RHYPERSPCE RORBIT/1
RORBIT/2   RORBIT/3   RORBIT1    RORBIT2    RORBIT3
RSWINGPREC RWHOOPEE
```

To save the current configuration (and hence save all the factors of the game and their current values), at the same menu press "W" and enter the filename. Each saved solar system configuration requires 2 disk sectors. A naming convention (such as the one above where the name of each saved configuration is preceeded with an "R") will help you distinguish the files better on a disk. Another 100 or so such configurations could be saved on a copy of the program disk. It is HIGHLY RECOMMENDED that you make a backup of the original disk and store the original in a dry, dark