

This document gives brief descriptions of each of the modelled systems in the Play God folder.

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File(model) name:      Description

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### **Good Geocentric Standbys**

#### **Std Earth-Moon**

The standard Earth Moon system:

Mass, distance, velocity, and size accurate to the real thing.

#### **A Moon's Moon**

Like Std Earth-Moon plus another moon for the moon.

Watch it fly by or chase it!

#### **Earth w/Craft**

Real Earth and craft. Highly recommended first step in celestial navigation.

#### **Earth-cMoon w/Craft**

Real Earth and closer Moon (same as real moon but 3/4 closer) plus craft.

Recommended second step in celestial navigation.

#### **Earth-Moon w/Craft**

Same as Std Earth-Moon plus a craft.

More like the real thing, but harder to interact with moon.

#### **Earth w/2Moons**

Like Std Earth-Moon plus a second twin moon 1/4 the distance from the Earth.

Crafts beware.

#### **Nice 3 Body**

A three body system with some nice moon interaction.

### **Binary systems and craft**

#### **Close to Initial L4,5**

The craft is in the fourth or fifth Lagrange point of a perfect binary system.

Unstable, but you only need change the masses and speeds. Also try spinning the system when paused.

#### **Leafy around Binary**

Craft in a leaflike orbit around a binary system. Watch the separate rhythms of the potential and kinetic energies.

### **Three body and other problems**

#### **3 Body Chaos**

2 bodies in the center in a binary orbit with one more outside waiting to disturb.

Slight perturbations in the initial velocity of the red one will change the outcome significantly.

#### **Drop into Binary**

Another chaotic system.

#### **Three's a Crowd**

A derivative of 3 Body Chaos. That binary system just doesn't want the red.

#### **Weird Grav Assist**

Derived from 3 Body Chaos. The red flips around the binary in a weird way,

then it gets an energy boost. Just watch.

May I have this dance? NO!!!

(a derivative of 3 Body Chaos: I happened to get this just right. Make sure Stats are off.)

Here is the lovely couple dancing in the center (blue: male yellow: female)

about to be intruded upon by another male! (red) He tries to win her heart,  
again and again... but he finally does! Then the blue comes to win her back

but no? yes! He does! Red is banished!

But red has one last trick up his sleeve....

### **Bobbing for Binaries**

Binary Bobbing

A set of three objects: Two half the mass of the real Earth in a binary system orbit  
with one more a sixth of the earth's mass bobbing through the center.

A good example for visualizing in 3-D. Watch the energy of the red one slosh!

Binary Bobbing 3D

Same as above w/ 3-D glasses

Binary Bobbing Craft

Same as above w/ a craft instead.

Lookout!-3DBin

Same as Binary Bobbing 3D except one binary mass is changed by less than  
one part in 30,000. Then... Lookout!

### **Navigating in Space: getting from here to there**

Transfer Orb 2

A derivative of Earth w/2Moons: The Craft is in a parking orbit around the  
inner moon. Zoom out to see the whole situation. Try entering a transfer orbit to  
enter a parking orbit around the second moon; it's more difficult than it looks.

Trnsfr&GrvAss Δ615 @860

Restricted feature. Disregard if using LT.

Enter in a Δv of 615 m/s at time step 860 and watch the energy figures.

It will give a beautiful boost out of parking orbit and gravity assist.

TrnsfrsOrbs- It Works!

An absolutely beautiful transfer orbit. From the same situation as Transfer  
Orb 2: Zoom in on the inner moon system and see the craft in a parking orbit.  
It will thrust when in the upper left. Zoom out and see it approach the second  
moon, then it will backward thrust and enter a new stable parking orbit!

Watch it all again with a -1 in the trail length box under Eye Attributes.

It's not quite a Hohman transfer orbit, but close enough.

See the energies rise and fall too.

It's just like JPL's.

Trnsfr Orb using 4ORK

Same as above except using 4.O.R.K. I had to adjust the numbers a little, too.

### **Miscellaneous**

Good method tester

The craft in a tight orbit around the earth. Try different methods/Δt's from I.C.s.

See computation speed and accuracy compromises.

$F=r^2$  dep

Alternate universe:  $\beta=2$ . Craft in a stable, fast orbit. Watch that energy bar.  
Figure out how to get to circular orbit and see viral theorem in energies.

#### Theo Mech Prob 1

Taken from the first take home problem Helliwell gave us in Theo. Mech.  
The craft is in orbit around a large central mass in a  $\beta=1$  force universe.  
Basically the craft is under the influence of a spring.  
Another good viral theorem example.

#### Double Cartwheels

Another variation of a binary system. Can you see what's there?

#### Double Cartwheels 3D-2

Same as above but in 3D comin' at ya.