
View AS-509
Mode target-relative
Dist 32.06
UT Sun Jan 31 22:15:05 1971
MJD 40982.9271
Sim 387s FoV 60°
How to get to Lunar Orbit the Easy Way
By Bob7

Contents

Introduction

When I first learned to go to the moon, there was a very nice tutorial (that is still around and still a very nice tutorial), but there were too many confusing numbers, and addons to download. So I decided to look for a better way to do this. What you see in front of you (not the computer, this document) is a compilation of works from that good old tutorial that we all know (*Apollo Lunar Mission Tutorial* www.jdkbph.com/ALMT/index.htm), the *How to fly the Saturn 5* document that comes with NASSP 5, and my own crazed ideas. So enjoy.

Requirements:

1. The latest and greatest version of Orbiter
2. NASSP 5.2
3. Orbiter sound
4. Some basic knowledge and experience with orbiter.

Step 1: Launch

Illustration 1The DSKY during startup

Ok, this is the easy part (well, its all easy). Start Orbiter and choose a lunar mission from the NASSP_5 folder. Any one will work. Now Launch. You will be presented with a view of your trusty trans-lunar spacecraft sitting on the launch pad. Now press the F1 key to enter the capsule. I know its cramped, but at least your not <u>really</u> in it. Now in order to work we need light don't we? So press CTRL + <- (thats my best imitation of the left arrow key). Now scoot over a bit so you could see the DSKY.

It will be running through its startup procedures by blinking funny numbers at you. No, this is not it's version of the blue screen of death, but you know your in trouble when it displays, “this program has performed an illegal action and must be shut down.” Once it is done the STDY light will be lit. press the PROG key to start using the computer. Now press VERB 37 NOUN 01 ENTER. This changes to program 01. In real life it would align the doohickey with the thingamajig, but here it just lights the NO ATT light briefly then switches to program 2, the launch setup program. On line 1 of the display it shows the launch azimuth. If you want to change it press VERB 21 ENTER then + (and the number with leading 0s) PROG. Otherwise, you could just leave it. Either way you will then have to press VERB 33 ENTER. Now it shows the apogee and perigee. To change these press VERB 21 for the apogee, and VERB 22 for the perigee, then enter the + and the # with the leading 0s. Whether you do or don't want to change it, you will then press VERB 33. On the top line it shows time to launch in hours, middle line shows minutes, and last line shows hundredths of seconds. For a count down press VERB 16.

Illustration 2DSKY running program 01

Now do that time excel to just before launch and enjoy the ride. Just remember to bring a barf bag :)

Step 2: TLI

GASP! It is time for the hardest part of the easy journey. Dare I say it, the Trans Lunar Injection burn. (More gasping). So lets hurry and get it over with.

Switch of the panels for now so you could see the MFDs better. Now switch to the transfer MFD (SHIFT + X). Select the target with SHIFT + T, then switch to HTO with SHIFT + X. You WILL see that the orbits are NOT aligned. Do not panic, you are already to stressed with the TLI. Now lets add a little Dv to our HTO by pressing SHIFT + =, or, if you do too much, SHIFT + -. Add enough Dv so it shows the white intersect line and there is a nice bit of extra outside the moons orbit. Now press SHIFT + <, and SHIFT + > until the intersect line and the orange dotted line line up. Vwalla, you have your burn calculated.

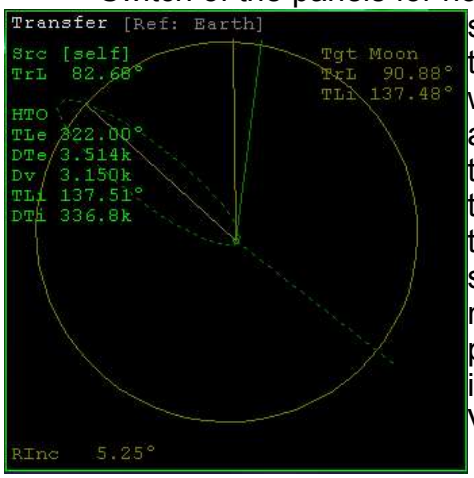


Illustration 3Transfer MFD with burn set up

Now its time to put it in the AGC. Trust me, you don't want to fly this by hand. People have and they've wound up around mars :o . Press VERB 37 NOUN 15 ENTER. This starts the TLI program. Please don't gasp every time I say TLI. Now, we have to set the burn time. Press VERB 22 ENTER +00020. Now do a time excel till the DTE in the transfer MFD gets to about 1.240. When it hits exactly 1.200 press PROG. The time is set to 20 min. till burn. At last, you must enter the Dv. Press VERB 21 ENTER then +(and the Dv, from the transfer MFD, with leading 0s and all) and PROG.

Illustration 4Setting burn time.

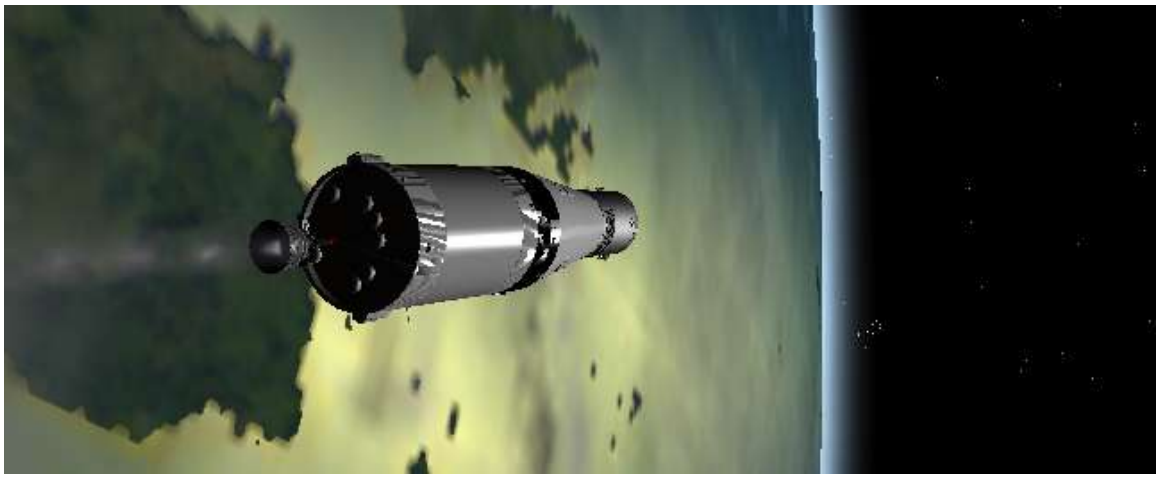
Illustration 6When DTe hits 1.200 press PROG

Illustration 5Setting burn Dv

Illustration 7DSKY showing time to burn, remaining DV, & cutoff velocity

For a countdown press VERB 16 ENTER. On the top line the computer will display time to burn in minutes and seconds, the second line displays remaining Dv, and the bottom shows the cutoff velocity. Around 9 minutes the up link light will be lit briefly. Be sure that you have all RCS systems and engine gimbals activated for the 3rd stage. At 1:45 the display will go black for a second. At 1:30 seconds prograde is activated. At 0:00 the RCS will light, ushering in the main engine. From here on all you can do is sit back and trust you life on a glorified calculator that controlling the release of millions of pound of explosive rocket fuel. Sound fun doesn't it? Don't worry, the computer ALWAYS get EVERYTHING right.

Illustration 8Activate RCS and engine Gimbals



Step 3: Docking with the LM

Now its time to dock with the lunar module. That is, unless you left it at home with your toothbrush. In the lower right corner of the panel you will find the jettison switches. There should be one labeled SIVBJ. Right click on it to open the cover, then click once more to release the 3rd stage. Immediately go to external view and switch RCS control to translational. Apply backward thrust until the CSM looks like it has stopped moving. Go back inside and hit CTRL + /\ (control key and the up arrow key). Press LC1 on the MFD display to turn it on. Then select the docking MFD and press SHIFT + V to switch to visual mode. Switch back to rotational and begin pitching up, but not too fast. When the LM comes into view kill rotation. Adjust the pitch until you are perfectly aligned in the docking MFD. Don't worry about the yaw at the moment. Now rotate left until the docking marker on the LM looks like an upside down T, then kill rotation.

Illustration 9Jettison switches with SVIBJ jettisoned

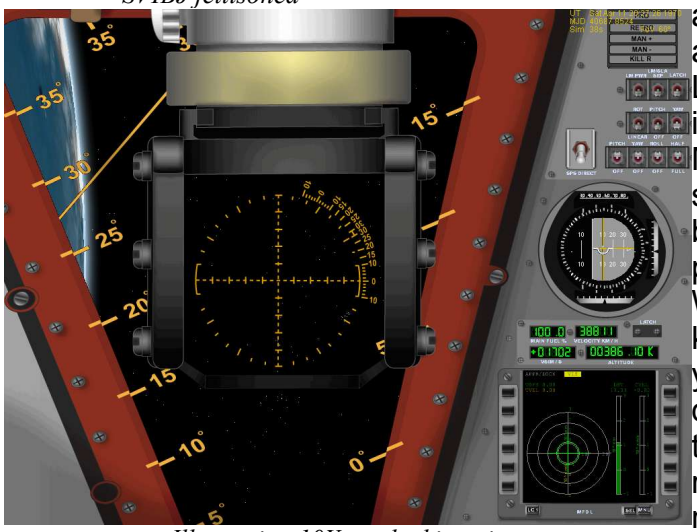


Illustration 10Your docking view

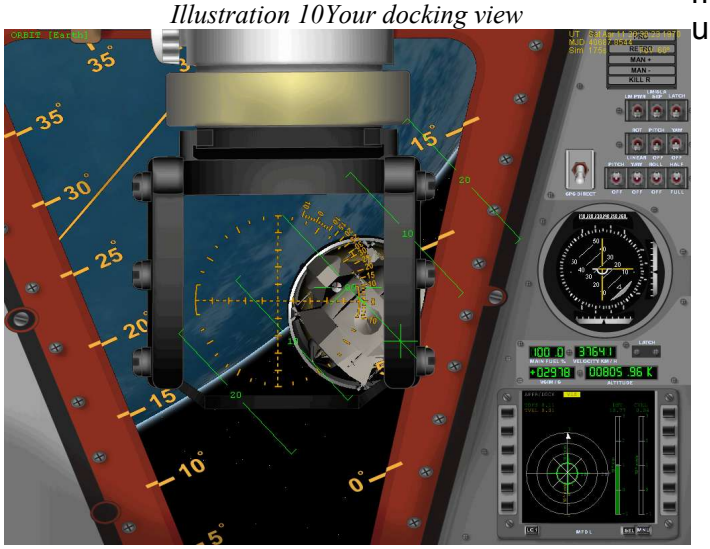


Illustration 11Docking view after turn around and roll adjustment

At last switch back to translational and apply forward thrust. Use the 1, 3, 8, 2, keys to adjust your approach. If you move too far left, press 1, too right, press 2, too up, press 8, etc. Once you get close enough the LM will suck you in and you will hear the pounding of the docking clamps.

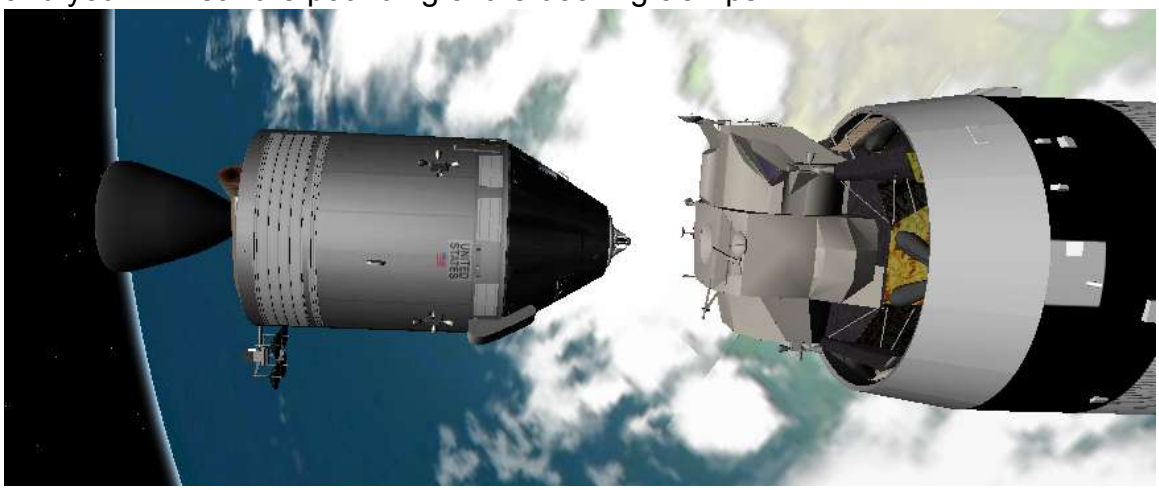


Illustration 12Outside view just before docking.

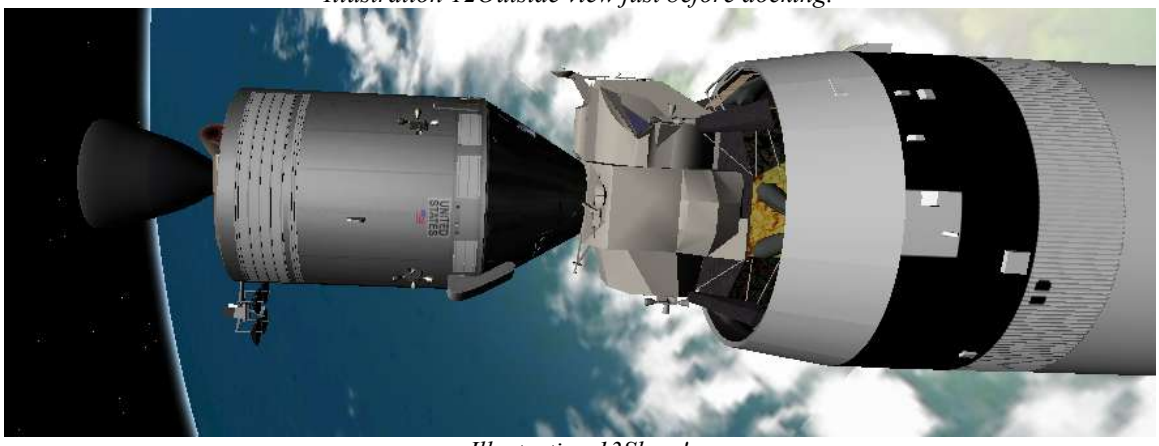


Illustration 13Slurp!

Press CTRL + V to go back to the main panel. In the very far right there is a set of switches for the LM. Press the first to power up the LM and the second to release the LM from the booster stage. Now take a little break. You've had enough excitement.

Illustration 14Lm power up switches

Step 4: MCC

This is where your really going to think of me as crazy. I don't blame you. Today we are going to do an MCC. Nothing wrong there, right? Now normally an MCC would be done with something like the trans X MFD, but no, our MCC will be done with nothing more than the orbit MFD. (Gasp). First, switch to that trusty little orbit MFD. Set the reference (SHIFT + R) to the moon. Make sure the view is set to ship. Go into time excel. You might want to hit killrot so you don't get dizzy. You will slowly travel on your path to the moon. Eventually you will hear a guy in a funny accent saying, “it is time for correction,” at which time the time excel will stop. If this amazingly does not happen then either the computer is broke or you did an ultra good TLI. In that case, wait till you are just before perigee (to the moon) and proceed to Step 5: Lunar Orbit Insertion. If you did get the correction signal then switch the HUD reference to the moon, switch on SPS direct, then switch off the panels. Now maneuver into retrograde. The retro navcomp function will NOT work here, so just move in the opposite direction as the prograde arrow. Fire the main engines at full power. Be sure to manually keep the ship oriented retrograde. If it responds too fast, deactivate the SM engine gimbals. When the your lunar orbit gets to about a ninety degree angle, or fuel levels read 70%, cut the engine. The real way to tell is to practice and find the signs that work best for you.

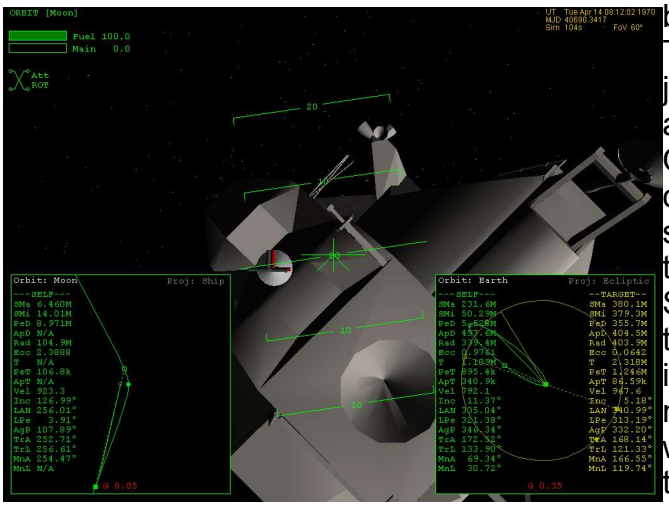


Illustration 15MCC view just before burn

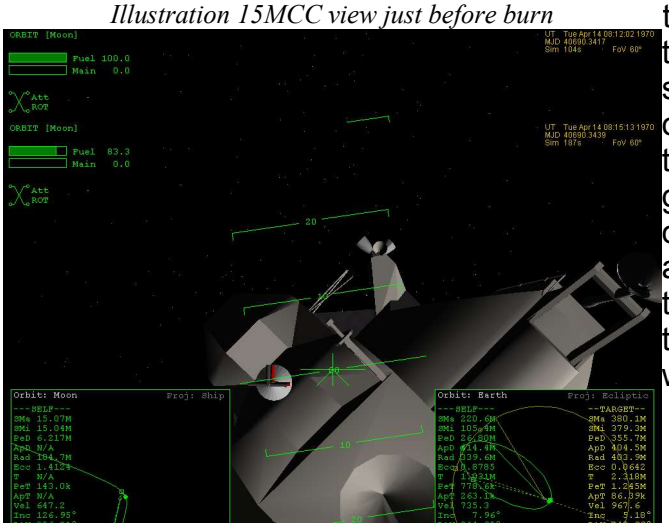


Illustration 17MCC view after burn

Illustration 16SPS Direct switch

Step 5: Lunar Orbit Insertion

At last, the moon. But you don't just want to pass it by. We want to “park” in lunar orbit. So lets do this. Do another time excel until you are at the perigee of your lunar orbit. Point that thing around to lunar retro again and fire up the engines. Keep that grill burning until you have a nice round orbit. Midway through the maneuver the orbit MFD will suddenly zoom out to show a big oval shaped orbit, and a bunch of new data will come in. This is when you know you are in lunar orbit, the rest of the burn is just the final adjustments. Welcome to the Moon.

Illustration 18Insertion view just before burn

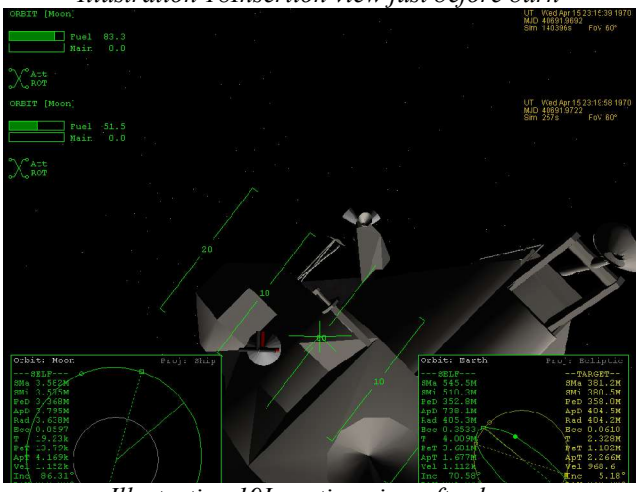


Illustration 19Insertion view after burn