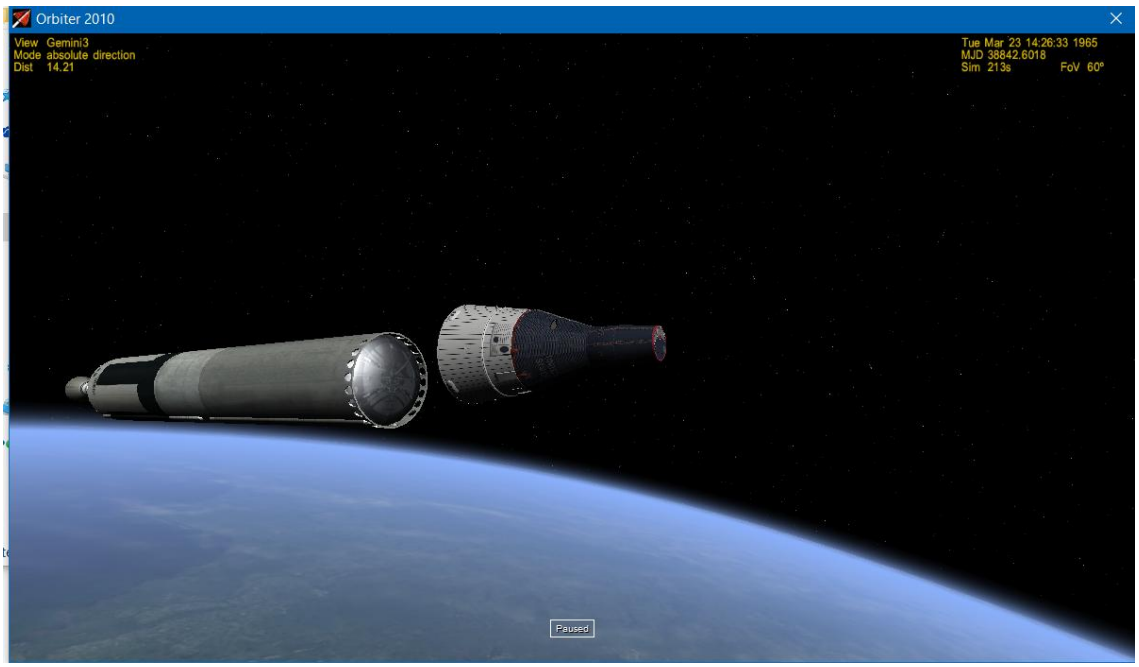
Gemini Joe

Single Stage Suborbital Test Configuration For The Gemini Spacecraft

Contents

Introduction: What is this add-on for?

In the earliest phase of Project Mercury, engineers conceived the "Little Joe" configuration in which a boilerplate space capsule would be launched by a small booster in order to test the reliability of the launch escape system (i.e., the escape tower), heat shields on reentry, and so on. In at least one test, the payload was not a boilerplate, but a functional Mercury capsule which carried a Rhesus monkey aloft. The Little Joe tests comprised America's first-ever launches of a spacecraft designed to carry a human being (or any higher primate). The Little Joe tests were found to be so useful that the same approach was used a few years later to test the Apollo command module.



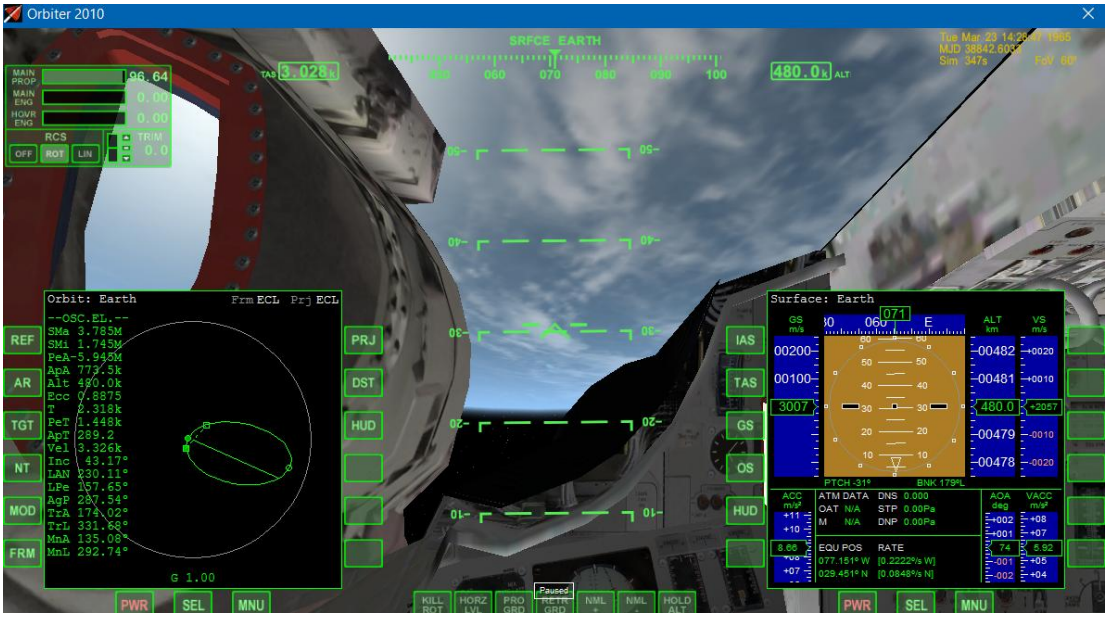
A. Jettisoning Booster. This mission is using the first stage configuration of Gemini Joe.

Primarily because the Gemini spacecraft used ejection seats rather than an escape tower, there were no Little Joe tests used. The earliest two Gemini missions were unmanned and the second one was suborbital, but both of these missions used the same two-stage Titan II launch vehicle as the manned missions that followed. Nevertheless, for those Orbinauts who happen to be intrigued by the earliest stages of the the American space program, this add-on may prove interesting.

Before proceeding further, I wish to emphasize that this addon is based primarily on Project Gemini, as initially built by **estar** and updated for Orbiter2010-p1 by **replicant,** and by extension on the work of everyone whom they credited for that project. A full list of acknowledgements appears at the end of this document.

As a result of incorporating the pre-existing Project Gemini components, those who download and fly this add-on will enjoy all the same realistic simulation effects of the earlier add-on. Just as with Project Gemini, when the booster is jettisoned the pilot's view will change to a simulation of the Gemini capsule interior, and the same

keyboard controls will work to perform such tasks as opening the hatch and dropping various parts of the spacecraft when they are no longer needed.



B. Opening the hatch gives us a dramatic view.

Required Infrastructure And Installation

The following add-ons are required:

1. **Project Gemini** for Orbiter 2010
2. **Orbiter Sound** (if desired)
3. **stage.dll** (Brianj's recent rewrite)
4. **Multistage2** for one scenario (see next section. Included in Project Gemini add-on, above.)
5. **Multistage2015** for all the other scenarios
6. **Spacecraft4**
7. **Earth1962** (if desired, in which case you will need to edit the scenarios to replace SOL with SOL_1962. The latter option is already coded into the scenarios but commented out, so all you would have to do is uncomment one line and comment out the other.

When you unpack the zip file, you will see four top-level add-ons folders:

- **Multistage2015**
- **Spacecraft4**
- **stage**
- **Gemini Joe**

Multistage2015, **stage**, and **Spacecraft3** are the utilities mentioned in the list of prerequisites given above. Like the **Gemini Joe** folder, each contains its own set of Orbiter subfolders. The utilities are included strictly for the sake of convenience, mainly for neophyte Orbinauts who may not have the utilities or possibly may not even know whether

they do or not. Each can be installed separately by copying its subfolders into your Orbiter2010 root directory. If you already have them in your Orbiter2010 installation, however, you needn't re-install them. In future, a reasonable effort will be made to keep them up to date with regard to any improvements or other changes, but this is not a guarantee.

Once you have all prerequisites in place, copy the contents of the **Gemini Joe** subfolder into your Orbiter2010 root directory.

Available Configurations and Ascent Plans

Rather than using a specially designed booster, this configuration uses either one of the two stages that made up the historic Titan II launch vehicle. This is the simplest and most straight forward approach since the Titan II was already the same width as the base of the Gemini equipment module, as a result of which no adapter is needed. Pairing the spacecraft with either booster configuration is thus extremely straightforward.

Most of the scenarios use Spacecraft4.dll (SC4) and Multistage2015 (MS2015). Using MS2, the guided ascent scenario using the second stage configuration was plagued by nearly continuous oscillations of a few degrees off prograde, during the powered flight, although the software has always been able to correct it. By contrast, when MS2015 is used, the oscillation is completely omitted in powered flight. However, in a free-flight scenario, I found that the second stage configuration was impossible to control, since the lightest touch on a rotational thruster would send the spacecraft spinning end over end. This may be due to the inherent instability of such a stubby and finless rocket, and that this instability manifests itself in MS2015 and SC4 due to a more realistic simulation. For that reason, the one unguided flight scenario involving the second stage configuration uses MS2 rather than MS2015.

Guided Ascents

There are two guided ascent scenarios--one for each booster configuration, and both work in much the same way. During the ascent, the rocket is first rotated and then gradually pitched down towards a heading of 71 degrees, so that a pitch of 45 degrees is attained just before burnout and separation of the booster rocket. After separation, the Gemini space vehicle is in free flight and must be controlled by the pilot. There is no automatic turnaround sequence.

Free Flight Ascents

There are three free-flight ascents, again one for each booster configuration using MS2015. In addition, because of the control issues with the second stage configuration using MS2015, the third free flight scenario lets you fly the second stage configuration using MS2. The free flight ascents are controlled in the same way as all Multistage implementations.

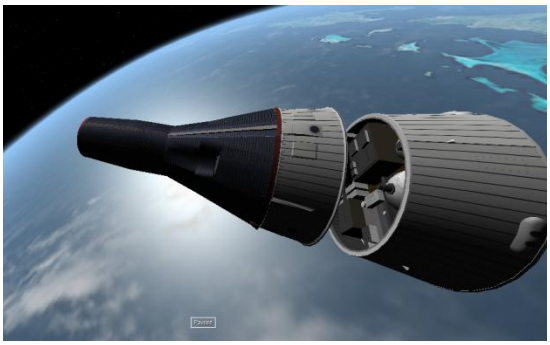
General Flight Plan Following Stage I Separation

Following first stage separation all flights will usually follow the same general outline, in which the following steps should be performed in the order given. The exact time of each step is flexible, as long as the equipment and retro modules have been jettisoned, and the capsule is in proper attitude for reentry prior to entering the lower atmosphere on its descent.

[J][J] (Press "J" twice) - This "creates" the two astronauts seated in the spacecraft, which are implemented as two additional "spaceships" in the scenario. Under a full Gemini mission, this arrangement provides the option of performing EVA from the perspective of the astronaut. In these suborbital missions, there will almost certainly not

be sufficient time for EVA, but these first two J-presses are needed in order to jettison the equipment and retro modules later, in preparation for reentry.

[J] - This **jettisons the equipment module**, or the widest part of the spacecraft as initially launched.



C. Equipment module separation

[J] - This J-press **jettisons the retro module**, which, however, remains docked to the capsule. Although these suborbital missions do not require a retro sequence, you can maneuver the spacecraft as necessary and test fire the retro system, as Alan Shepherd and Gus Grissom did on their suborbital Mercury missions. To fire the retros, perform all of the following five steps. To discard the retro module without firing, you need only do steps 2, 4, and 5, marked here in bold:

1. Maneuver to a typical retro firing attitude (typically pitched down ~100 degrees off prograde
2. **Press [F3] to open the Select Ship menu, choose the retro module (Gem_retro)**
3. Apply main forward thrust to fire the retro rockets.
4. **Still with the retro module as your focus, enter CRTL-D to undock the retro module. If you are in external view, you will see it separate from the capsule, or reentry module.**
5. **Open the Select Ship menu again, and choose Gemini3 to return focus to the reentry module.**

[G] Toggle left hatch open or closed (optional). This can be done at any time before reentry, if desired.

Prepare for reentry. Maneuver the spacecraft to an AOA of nearly 180 if not yet completed.

Reentry. Typically there isn't much to do here. However, the capsule does generate some lift, and you may wish to use this to target a particular location for landing. For more details, see the documentation for Project Gemini

[J] - Jettisons the spacecraft nose cone.

[Shift+Numpad1] - Deploys the parachute. (Same as Gemini for Orbiter2010.) On my system I have no actual numpad, nor does the Virtual Numpad add-on work in this case. My older computers that do have numpads really aren't fast enough for this program. Thus I'm unable to see this work for myself, but if it works in Project Gemini it should work here as well.

Planned Improvements

- Eliminate EVA capability as inappropriate for missions of such short duration.

- Configure a scenario in which only the Gemini capsule, without the adapter section, would be test flown using the Little Joe booster used in the Mercury LJ launches.

Acknowledgments and Credits

Humble and heartfelt thanks go out to the following.

- Richard Boozel (replicant) - for the Orbiter 2010p1 Gemini upgrade
- Rob Conley (Estar) - for many of the original Gemini Meshes and textures, especially the Titan Rocket Meshes.
- Vinka - for the multistage and spacecraft DLL's, especially since my addon here is nothing more than an application of Multistage's capabilities.
- BrianJ- for the stage.dll revision
- Donamy - for meshes and textures
- AR81 - For Orbiter Mesh Wizard
- saturn v - For the Launch complexes, Atlas rockets, and scenarios
- jekka and MartySpaceLines - For Some of the Meshes and Textures borrowed from MSLJ Gemini
- 4throck - For textures
- Martin Schweiger - For creating orbiter
- And anyone else I may have overlooked. If so, please accept my apologies and let me know.