

The Descent of Anansi

Scenario by Sputnik
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The Descent of Anansi was a 1982 novel by Larry Niven and Steven Barnes. (Discussed here under the doctrine of Fair Use. And thanks, guys, for providing a textbook and a playground all in one).



In it, a space shuttle is going from the moon to the earth with a precious cargo: a coil of super-strong cable. The cable has been purchased by a construction company for a mega-bridge, but the losing bidder isn't giving up quietly.

Attacked by an anti-satellite weapon and intercepted by a pair of shuttles that are more hostile than they seem, the crew of *Anansi* conceives a desperate plan: attach the cable to the shuttle bay, and use it to de-orbit the shuttle!

This scenario requires TetherMFD by MattW (not included). As a demo/tutorial of the capabilities of TetherMFD, it should leave you with the most important basic skill; no-fuel de-orbiting (or boosting) with a tether.

Installation

Unzip the files into their respective folders. Note that the scenario includes a new shuttle module, texture, and a new mesh.

The Setup

You're in the shuttle *Anansi*. The attack has knocked out your OMS pods, aft RCS quads, and most of your fuel. This leaves you only the forward quads (rotation only, at reduced rate, plus translation aft).

Fortunately, the cable pod was nearby and not badly damaged. The thermal protection system was too badly damaged to permit the pod to re-enter as designed, but the cable is undamaged, and you have salvaged some of its de-orbit motors (limpet motors). On a previous EVA, you've strapped these to the OMS pods. For this reason, you have "main" engines. They're very weak, and there's not much fuel, and you won't even see how much is left (they burn from a different tank). But it's enough to pull off this scenario.

The ion tug *Gabriel* was pushing you and the cable pod from the moon to the Earth. It was destroyed in the attack, and I haven't modeled the wreckage for this scenario. So sue me. How an ion tug is supposed to push a shuttle from the moon to the Earth in 4 days is beyond me anyway.

The shuttles *Brasilia* and *Willy Ley* are pretending to be your rescuers. They WILL give you a ride home...but they'll claim the cable pod as salvage. It's why you were attacked in the first place, so you'd rather not take them up on it. They aren't important to your task; they're just eye candy. These two shuttles are just the Orbiter-stock *Atlantis*, without retexturing.

Note that the *Anansi* is also an Orbiter-stock *Atlantis*, but re-compiled to reference a mesh with the changed textures, and with some thrusters disabled (and the limpet motors added). Most importantly, the keyboard handling was rewritten so that it doesn't pre-empt SHIFT-J. So you can use TetherMFD (and the other two shuttles can't.)

Employment

Let's get this show on the road, shall we?

1. First, let's hook up the tether with TetherMFD. We'll keep the initial length at 1000m, but dial the force WAY down. To 47.2, say: ->
2. And Join the tether.
3. Now, point Retrograde so that your limpet motors will deorbit you for a pathetic little bit.



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Tether MFD
SETUP:
Force Mode : Anansi - Anansi
Process Mode : Cable_Pod - AnansiPod
Length (m) : 1000.0
Force (N) : 47.2

+0+-1--2--3--4--5--6--7-
RUNNING: @ 01D61F18

Status: Connected
MFD Pod : Anansi - Anansi
MFD Mode : Cable_Pod - AnansiPod
Length : 1000.0 m
Distance : 58.9 m
Process : 0.000 %
Force : 47.2 N
Pull : 0 N
Reel : 0.00 m/s
  
```

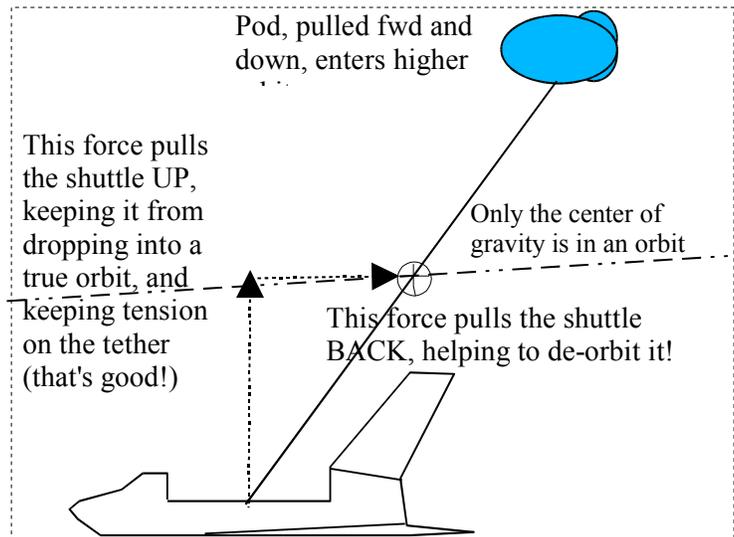
4. Pointed retrograde and tethered, thrust your limpet motors to depletion.

5. Use "O" to extend the tether. Hit it several times; you want about 20km of slack. You could have generated this much slack when Joining the tether in the



first place, but then the tether would look a mess, and you LIKE nice photogenic shots like this one, right?

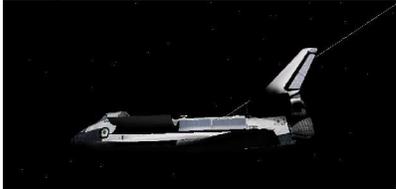
6. Stop the tether at 20 km.
7. Over the next 1/3 of an orbit or so, you'll drop behind, then below, then below and ahead of, the cable pod. This is good; you don't want to put tension on the cable until you're below and AHEAD of the pod, like this:
8. Once the slack is about taken up, start extending the tether again. There's no "snubber" per se, so you need to have the tether extending when the slack is taken up. Otherwise, the shuttle might bounce back towards the cable pod, and you don't have the fuel to fix that.



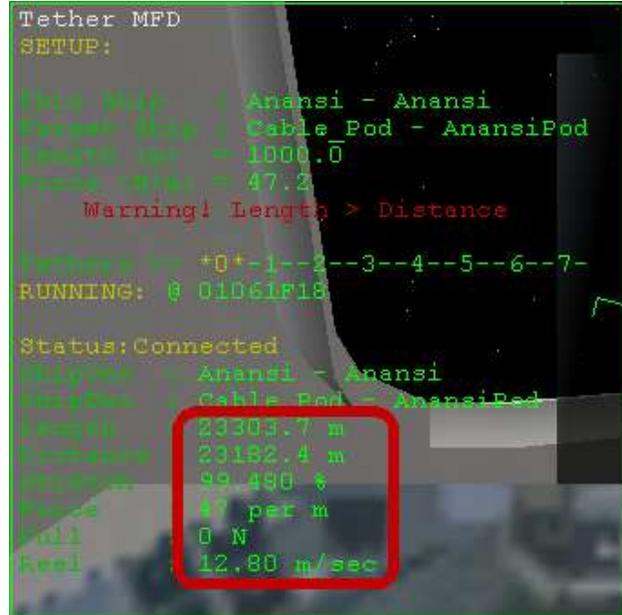
9. Once the slack is taken up, keep the tension on it while extending it as fast as practical. This will be at the 6.4 or 12.8 m/sec rates, and will increase to 25.6 and more as the tether gets longer (and tidal forces get stronger).

10. Your position should stabilize. Wait for your orbit to improve!

11. Keep the cable from cutting into the shuttle! It's really thin, which means really sharp. This is bad:

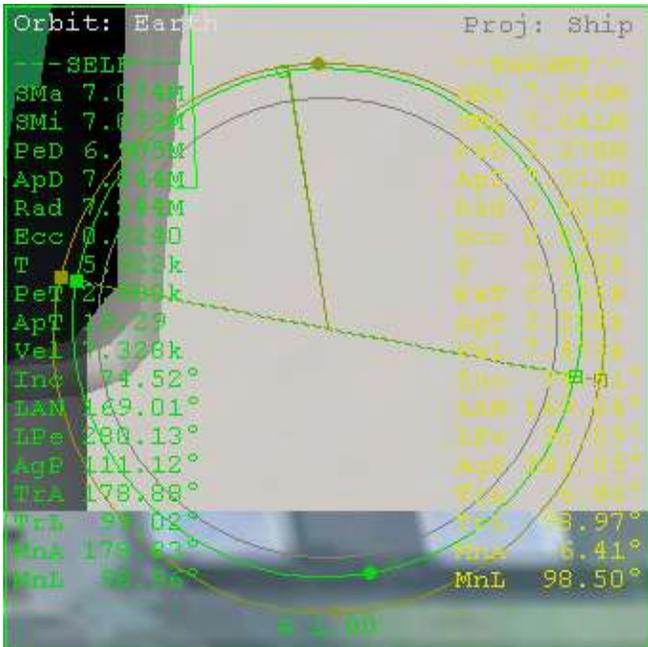


And this is worse:

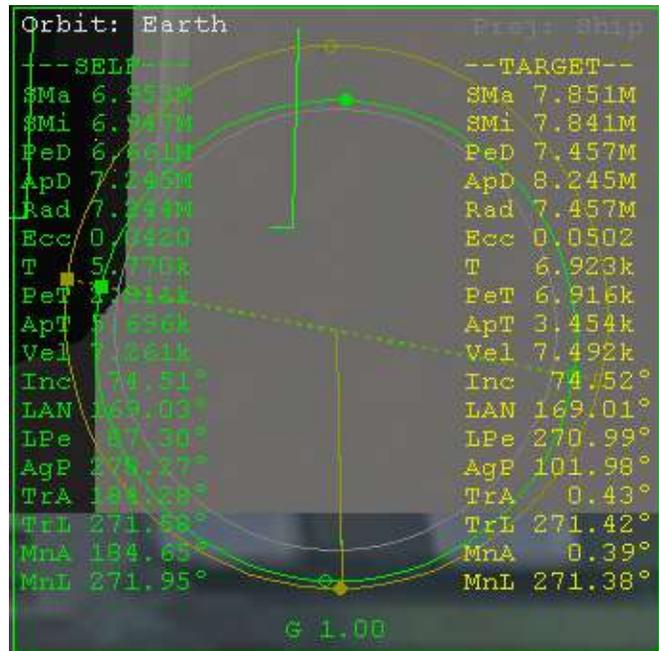


12. The Orbit MFD is a great tool to tell you your INSTANTANEOUS trajectory, but remember it doesn't understand tethers, so it's not really telling you your true path.

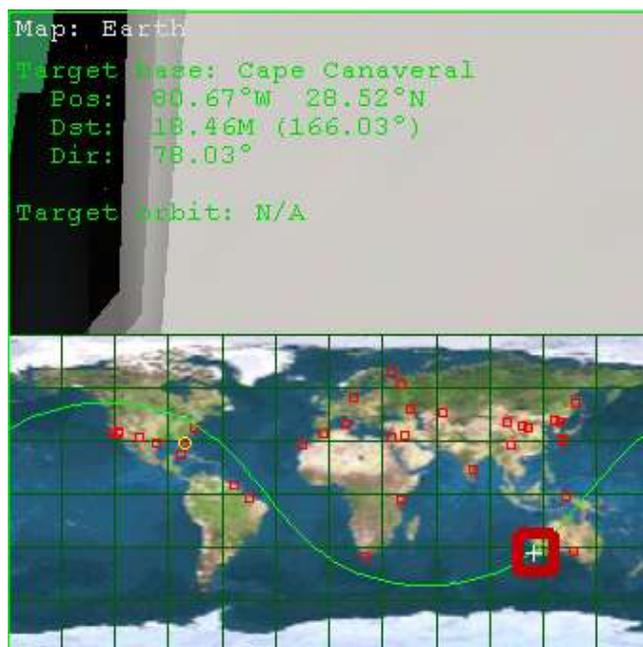
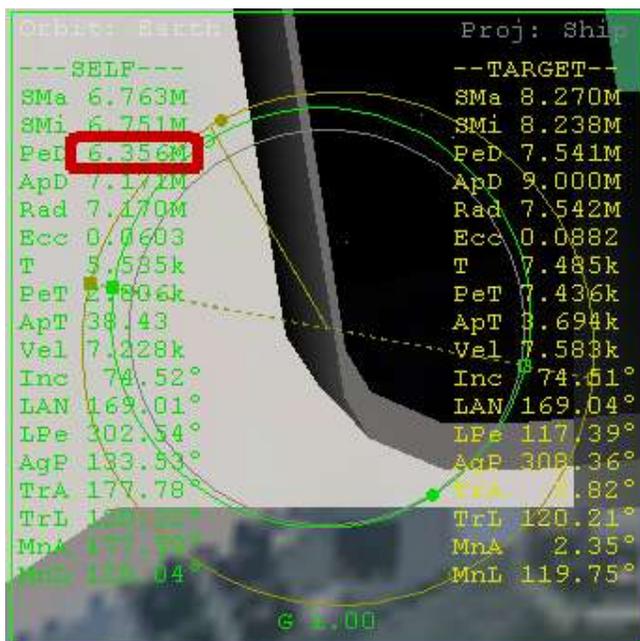
It's working:



And half an orbit later, it's time to think about cutting loose and re-entering:



This looks like a good time to cut loose:



13. Use the “U” to jettison the tether. Immediately, you’ll be on the inertial path shown on the Orbit MFD. Way to go! Hope it’s in the atmosphere, and about where you want it.

14. In the book, the crew landed at Tokyo-Narita, but I’m not making THAT add-on just for one scenario! So let’s head for Canaveral instead.

15. Mission accomplished!

Notes

Now that you’ve got the basic skills to de-orbit with just a tether, there are plenty of possibilities. You can raise your orbit instead. You don’t need to use the cable pod as your target; a good space station will work as well. (Preferably one with ion thrusters or some other cheap way of making up the delta-V losses from you dragging it around).



Acknowledgements

Thanks to MattW, of course, for making the TetherMFD. Finally, tethers in space!

Thanks, of course, to Larry Niven and Steven Barnes for an excellent story that also makes an excellent learning tool!

And thanks, of course, to Martin Schweiger, for finally inventing the simulator I used to daydream about in astrodynamics classes.

Version history

v1.0

Initial (and final, I hope) release! It’s just a scenario, for crying out loud.