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PARACONE E-500 USER'S MANUAL

Congratulations on your purchase of the Pangloss E-500 Paracone re-entry system! The E-500 is our most popular model of personal re-entry package, suitable for use as an emergency re-entry pack, or for basic sport jumping. Other models include the E-750 with precision guidance package, for precision sport jumping or routine cargo deadfall delivery, and the E-1000 which, paired with our partner company's Zvezda Z-20 ejection seat, provides a comprehensive crew-survival package from launch to landing. To exchange or upgrade your E-500, see your authorized Pangloss Aerospace dealer.

Components

The E-500 Paracone consists of the following components:

1. **Backpack.** This attaches to the back of your suit's life-support pack. It contains:
    a. Dry-nitrogen bottle. It inflates the:
    b. Refractory-metal heat shield, folded to fit within the backpack. When inflated by the nitrogen bottle, the heat shield's integral mylar ribs inflate. The back panels of the backpack will snap off to allow the heat shield and ribs to expand to their full 7.5-meter diameter.
2. **Propulsion package.** This consists of:
    a: U-shaped arm to hold the retro-motor package in the stowed position, or deployed in front of the user.
    b: Solid-fuel retro motor.
   c: Cold-gas attitude jets. These are fed by the nitrogen gas bottle in the backpack unit.

Installation

The E-500 Paracone installs to the back of all standard suit life-support packs. Special arrangements are required to accommodate Orlan and Sokol suits. See your suit-specific installation manual for detailed attachment instructions.

Employment

Usage of the E-500 Paracone is simple:

1. Deploy the retro-motor and the heat shield with the "K" key.
2. Orient <u>Prograde</u> to allow for retro fire.
3. Engage the retro-motor "-" to de-orbit.
4. Engage Killrot mode.
5. Drift inertially; as you orbit around the planet towards perigee, the heat shield will be oriented forward.
6. Aerodynamic forces will continue to point the heat shield forward during re-entry. (Base-first entry). No user action is required.
7. The re-entry thermal load is within your suit design limits. No user action is required.
8. The paracone re-entry shield also makes a high-area drag device, making an additional parachute unnecessary. To slow to a safe terminal velocity, no user action is required.
9. The Paracone will impact the ground at low terminal velocity, crushing the forward cone to allow a gentle cushioned landing. No user action is required.
10. Once landed, unstrap from the life-support pack and stand up. ("J" key). Caution: do not unstrap until all motion has stopped! Exercise caution as the inflatable heat shield should rupture on impact, gently settling to the ground.
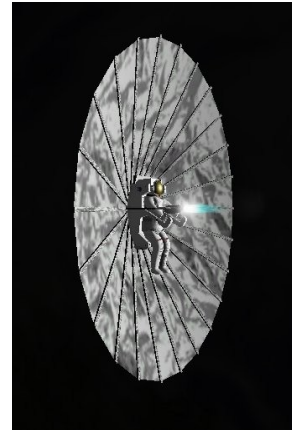
CAUTION: While the Paracone will point forward due to aerodynamic forces, re-entry with significant misalignment (more than 30 degrees) from the base-first direction may lead to heat loads beyond the ability of your suit to compensate.
CAUTION: The Paracone is intended for use from a stable, circular, low-altitude orbit. If already in an orbit which intersects the atmosphere, skip the retrofire step. If in too high an orbit, the Paracone will be unable to de-orbit to a re-entry. High-velocity entries, as from a high elliptical or hyperbolic orbit, will exceed the heat capability of the unit.
CAUTION: Exceeding the rated mass (250 Kg) of the E-500 Paracone could cause the retro motor to have insufficient delta-V to de-orbit, stranding the user in orbit. In the event that the Paracone DOES re-enter when overloaded, excessive terminal velocity may result in injury to the user.
CAUTION: Payload masses of less than 250 kg could lead to too low a perigee, which can lead to excessive G-loading at re-entry. To prevent this, use a de-rated de-orbit motor; see your Pangloss dealer for details. Alternatively, you can "waste" delta-V by pointing somewhat towards the + or – normal direction. Exercise caution that not too much delta-V is wasted, stranding the user above the atmosphere.
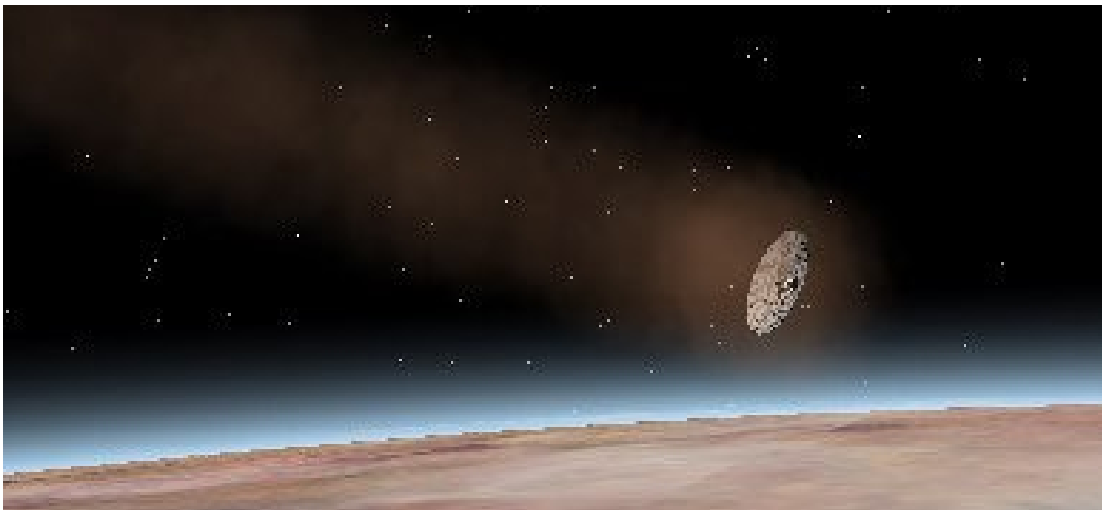
Acknowledgements

Thanks to Daver, Mav, Hendo, Simon, and the entire CVE-Lite team for the CVEL code. This code allows specification of the "payload" in the scenario file.
And again to Daver for the code on which this module is based.
Thanks to Hendo, Mav, and MrBatman for testing.
And thanks, of course, to Martin Schweiger, for finally inventing the simulator I used to daydream about in astrodynamics classes.

Version history

v1.11
  Re-compiled for Orbiter 2010

v1.1
  Converted to CVE-Lite
  Added ParaconeGem and ParaconeDG3 classes, allowing Paracone to be invoked with these suits
  Added Jettison (unstrap) function

v1.0
  Initial release!
  GPDS works with multiple payloads
  Mesh tweaked
  DGIIIMmu astronaut tested with Paracone

v0.2
  GPDS/CVE implemented; only first payload adds mass.
  Model optimized to work with MMU or Gemini astro

v0.1
  Not released.
  GPDS/CVE not implemented
  Model needed work.

Notes

If you didn't like the user-manual format, I apologize; I couldn't resist.
Naturally, unzip and put the folders in their respective folders in your Orbiter install.

This add-on uses the GPDS format to specify the "payload" of your Paracone. In this way, you can specify just what kind of suit you want to wear! Substitute for these lines in your scenario file:

Default MMU suit:

```
PRPLEVEL 0:1.0 1:0.9
PAYLOAD EVA-0x mmu nasa_mmu 0 -0.4 0.20 212.0 0.0 1.0
```

For the Gemini EVA suit (NOT included; part of the Gemini add-on):

```
PRPLEVEL 0:1.0 1:0.70
PAYLOAD EVA-0x gem-eva1 Gemini_leva  0.0  0.0 0.0 150.0  0.0  1.0
```

For Dan Steph's DeltaGlider III suit (NOT included; get the DeltaGliderIII add-on):

```
PRPLEVEL 0:1.0 1:0.85
PAYLOAD EVA-0x DGIIIMmu DGIIIMmu 0 0.0 -0.1 200.0 0.0 1.0
```

Where "EVA-0x" matches your CB number (CB-01 or 02 or 03).
Note that these lines decrease the fuel level ("de-rating" the motor) to compensate for the
lower mass of these suits. You'll get equivalent performance from these settings.

You can set any payload or payloads you want, to include, say, a 250-kg crate (deadfall cargo
delivery). Sorry, though; the advanced re-entry autopilot of the E-750 model is not
modeled in this release.

You can instead spawn a Paracone with a suit included. This is useful if, for example, you'd
like to write spacecraft code where you can EVA with the retro-pack attached. With this
mode, the specified suit is plugged in as a payload, but no other or additional payload is
possible.
Invoke Paracone to invoke a Paracone with stock NASA MMU.
Invoke ParaconeGem to invoke a Paracone with a Gemini suit.
Invoke Paracone2001 to invoke a Paracone with a suit from 2001: A Space Odyssey.
Invoke ParaconeDG3 to invoke a Paracone with DanSteph's DeltaGliderIII MMU.

You can reference any of these in the scenario start; if you give them a CVEL payload string,
they'll use that INSTEAD of the default listed above. With no payload string, or invoked on-
the-fly, they'll put in the suit listed above. To call up a Paracone pack that won't put in any
default suit for any reason, invoke ParaconeNoSuit.

There is yet another mode you can try; attachment. For any suit that supports it (currently only
the suits I've done), you can get to within a meter of an empty pack, press "S", and strap in.
"S" to unstrap again.

The concept of re-entry packs is not new, nor is it as crazy as it sounds.   Back in the 1960's,
several craft for rescue from orbit were proposed. These simple, basic spacecraft would be
optimized for the task of getting a spacesuited human back from orbit. (Some came
complete with an ejection seat for use, for example, from an X-20). The most famous of
these concepts is the GE "MOOSE." Astronautix.com has an entire page dedicated to
orbital bailout schemes at http://www.astronautix.com/craftfam/rescue.htm
The particular concept I chose to model is the Douglas Paracone, described at
http://www.astronautix.com/craft/paracone.htm
The Douglas Paracone was chosen because it was the easiest to model, frankly. Though I did
change a few things to make it more suitable for Orbiter use, such as the shape of the arm,
and retaining the retro-motor.
The scenario title ("Cannonballers!") was taken from a science-fiction short story I read but
can't seem to track down. (If anyone can point me to it, I can credit the author). It was
about a group of orbital tourists who would sport-dive from orbit using similar gear. Hence,
the scenario, where some sport-divers are outside the ISS and ready to return to Earth.
The object is to hit the Australian Outback, where presumably someone will be able to
come and get them. A continent is a big target, but the Paracone isn't easy to aim....

Enjoy the ride!
Sputnik
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