2.16 Endosafe®-Portable Test System (PTS)

FLIGHT DATES:
August 31, 2004

PRINCIPAL INVESTIGATORS:
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OBJECTIVE:

Evaluate most effective fluid dispensing system for use on ISS.

INTRODUCTION:

The Portable Test System (PTS) is a hand-held device for monitoring the presence of potentially hazardous bacteria in the environment. It uses an immunological method derived from the horseshoe crab (*Limulus polyphemus*) to detect bacterial cell membranes and other molecular

components of a cell. Further modifications of the PTS will allow detection of individual hazardous species of bacteria.

This study was a follow-up of previous PTS and other immunological tests performed on the KC-135 during 2002-2003 (Maule *et al*., 2003, *J. Gravit. Physiol*.) and in the underwater habitat *Aquarius* during NEEMO 5 (Maule *et al*., 2005, *Appl. Environ. Microbiol* in prep.). The experiments described here were part of a final testing phase prior to use of the PTS on the International Space Station (ISS), scheduled for launch on 12A.1 on February 9th 2006. The specific aspects of PTS operation studied were those involving a fluid component: pumping, mixing, incubations and pipetting into the instrument. The PTS uses a stepper motor to move fluid along small channels, which may be affected by reduced gravity.

METHODS AND MATERIALS:

The dimensions and appearance of the PTS and cartridges are shown in figure 1 below. Figure 2 shows the layout of personnel and equipment in the aircraft. Three fluid dispensing techniques were tested and evaluated in l constant volume pipette and 3.µg: 1. Simple Pasteur pipette, 2. 25 Screw syringe pipette developed at NASA Marshall.

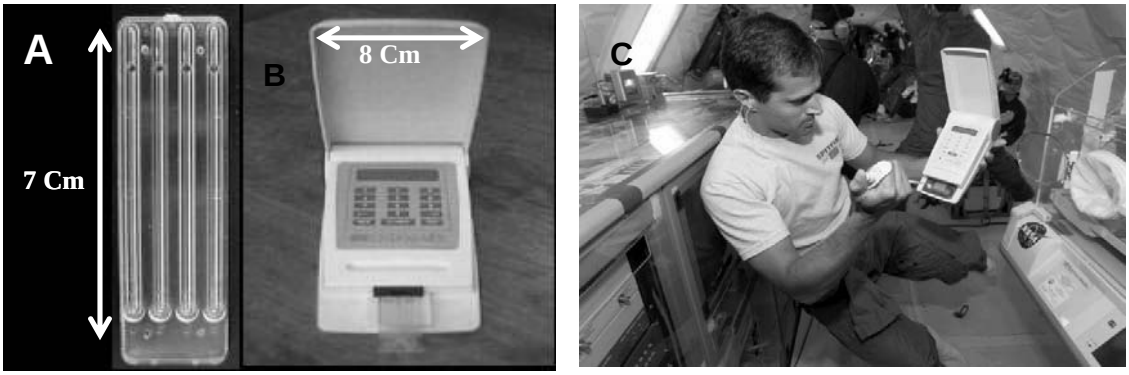

Figure 1. A, Portable Test System (PTS) cartridge. **B**, PTS (weight 2 lbs). **C**, Operator performing PTS operation in hand-held format in microgravity.

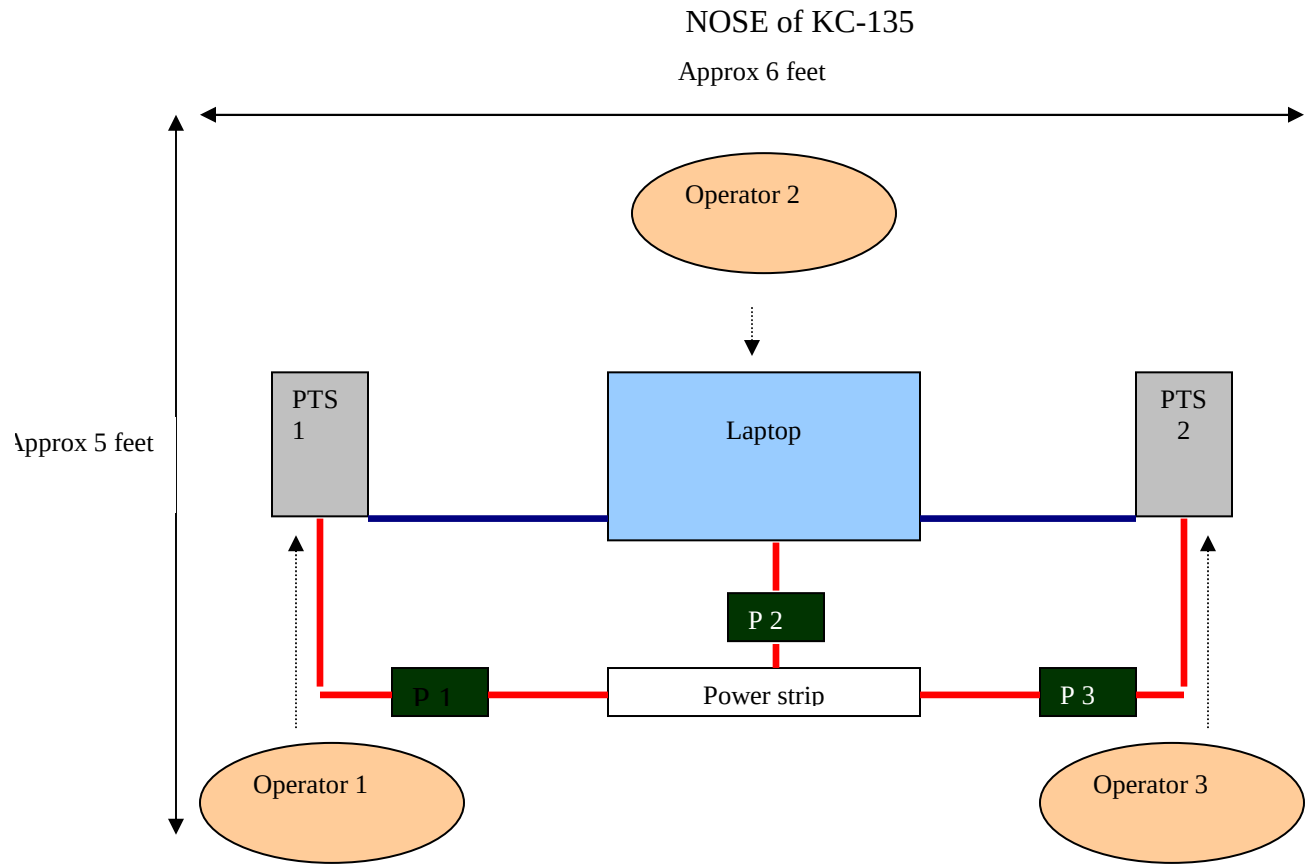

Figure 2. Layout of personnel and equipment on board the aircraft. P1-P3 = power supplies. Red line = power cord. Blue line = data connection.

RESULTS/DISCUSSION:

1. While the pasteur pipette dispensed fluid droplets of a uniform size and volume in 1g, this was extremely variable in microgravity: droplets would frequently expand and adhere to surfaces outside the well of the PTS cartridge.
2. Although the 25µl constant volume pipette took up a constant volume of fluid, this fluid often adhered to the upper section of the pipette tip. This prevented the expulsion of the complete 25µl volume into the PTS cartridge well.
3. The NASA Marshall pipette prototype delivered a constant volume, but following fluid adhesion to the surface of the PTS cartridge, further fluid volume was drawn out of the pipette. The pipette tip was too blunt to allow easy access to the PTS cartridge well; a narrowing/sharpening of this pipette would facilitate use with PTS cartridges.

CONCLUSION:

1. Sharpen tip to allow access to PTS cartridge wells
2. Enable thorough mixing in pipette

These modifications have been performed as of 3/25/2005 and require a final microgravity test before PTS phase 2 safety review on 5/8/2005 and launch on 12A.1 on 2/9/2006.

PHOTOGRAPHS:

JSC2004E39740 to JSC2004E39780

VIDEO:

- Zero-g August 30 – September 9, 2004, Reference Master: 718586

Videos available from Imagery and Publications Office (GS4), NASA/JSC.

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