

# Mission SuperChill Pluto Edition Training Manual

## Brief Summary

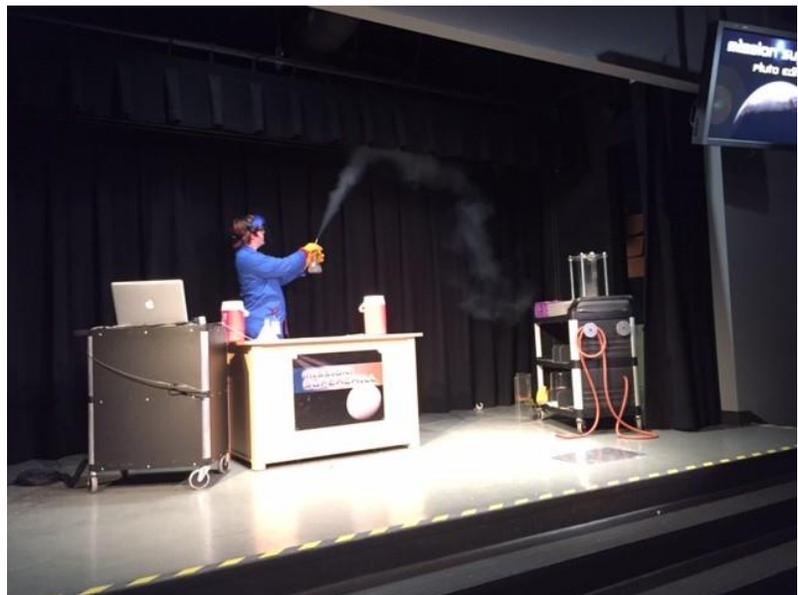
Using media, props, a TV camera and liquid nitrogen (LN) a demonstrator will illustrate the surface conditions on Pluto. In addition this show presents some of the challenges NASA scientists and engineers will face in designing a spacecraft to visit Pluto or other such locations. **You must complete the training requirements (listed at the end of this document) before performing this show.**

## Educational Strategy

Rather than perform a stand-alone “Liquid Nitrogen Show” the main teaching points have been connected to Space Odyssey by putting them together as part of a story of an imaginary “what if” trip to Pluto.

## Equipment Required

- 1) COMPUTER CART (on left of photo. Note this shows an older version of the computer cart
- 2) DEMO DESK (in center of photo)
- 3) MISSION SUPERCHILL STORAGE CART (on right of photo) –cart containing all the props and equipment for the show.



Naomi demonstrating a geyser during Mission Superchill Pluto Edition Show. On the screen on upper right, audience sees the Mission Superchill title screen.

Close up of STORAGE CART

Left  
Right

Center

Three PURPLE Tubs	Geyser flask and funnel	Large Demo Dewar
Two plastic shields & thin metal plate	Red Thermo s #1	Red Thermo s #2
gloves	Vacuum jar	Vacuum pump

Note that face shield is stored on top of the plastic shields for the rubber ball



STORAGE TUBS #1, #2 AND #3

*Right:* PURPLE TUB #1:  
Rubber ball  
Rubber tubing  
Nylon woven strap  
(Balloon may also be there, not used in this version of Superchill)

*Center:* PURPLE TUB #2:  
Brass ball and ring  
Bicycle bearings  
Magnetic bearings

*Left:* PURPLE TUB #3:  
This experiment is not used  
in this version of the show

Metal Tongs are located at the front of the cart by the Glass Dewar



PURPLE TUB #3

PURPLE TUB #2

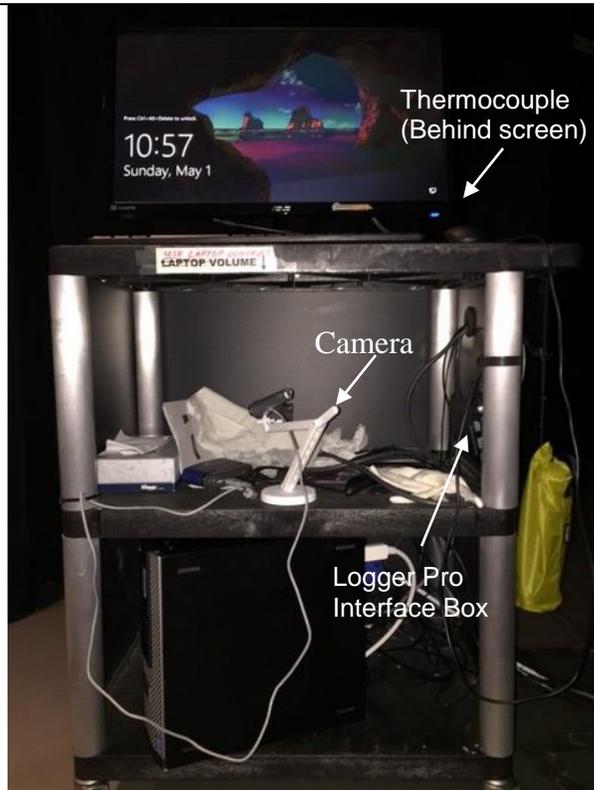
PURPLE TUB #1

## COMPUTER CART

*Right:*

Thermocouple and leadwire (not seen under screen). Below is the Logger Pro interface box. You should never have to make changes to this box.

*Centert:* TV CAMERA



## TV Camera



## Main Teaching Points

- Ordinary materials such as water can exist in three phases: solid, liquid and gas; so can nitrogen.
- As you move out in the solar system getting farther from the sun, planets and their moons get colder.
- Pluto is so cold (minus 391 deg F) that nitrogen, which makes up 80% of the air we breathe, can condense to a liquid or even freeze solid.
- Materials change properties at supercold temperatures, and those such as plastic and rubber can become completely useless on Pluto because they become stiff and brittle.

Before NASA scientists and engineers send a spacecraft to places like Pluto, they will have to modify designs and invent new materials.

- Sometimes when you are trying to solve a problem, the best approach is to take a whole new approach rather than modifying a previously solution.

## **NOTE about preparing to do this show**

- Due to the safety issues related to handling Liquid Nitrogen, **you must be 16 years or older to be trained to do this show**
- Due to the safety issues related to handling Liquid Nitrogen, to do this show you must be certified by the appropriate staff member. **No cross training** on this show.
- Besides reading this Mission SuperChill's TRAINING MANUAL, you will also need to master two other documents: LIQUID NITROGEN SAFETY PACKAGE and MISSION SUPERCHILL SHOW SCRIPT.

## **Operating Tips**

DO's

- DO bear in mind that Liquid Nitrogen is classified as hazardous material and that all safety guidelines **MUST** be followed at all times. **NEVER do any informal experiments or unauthorized stunts.**
- NEVER leave any LN out within reach of visitors
- Always keep the TIPPING CART locked when you are not physically present.
- Double check all show pre-sets, as there are **many things if not set up properly that can spoil the continuity of the show.**
- DO keep the show moving. It needs a brisk, but not rushed pace.
- DO **motivate** each movement or equipment change, that is, tell what you are going to do before you do it. The audience won't mind the wait as you get equipment set up since they will be excited to see what comes next.
- DO stick to the blocking (ie the movements of the performer and the props) as written in the script. The blocking and procedures have been carefully worked out for safety to audience, to minimize tripping and other safety hazards for the performer and to keep the show pace up.
- DO remember that the phenomena on display are the stars of the show; the performer is more the "Master of Ceremonies" than the lead. Therefore, DO allow time for audience to observe the phenomena as its happening for a moment before launching into an explanation, since the audience will be watching the phenomenon and not listening to you.
- DO rehearse the wording of the script, though reciting it dead letter perfect is not required.
- DO rehearse all aspects of the show. Otherwise, you get dead air and non-purposeful chatter.
- DO make sure that all audience members remains in their seats and no one comes on stage.

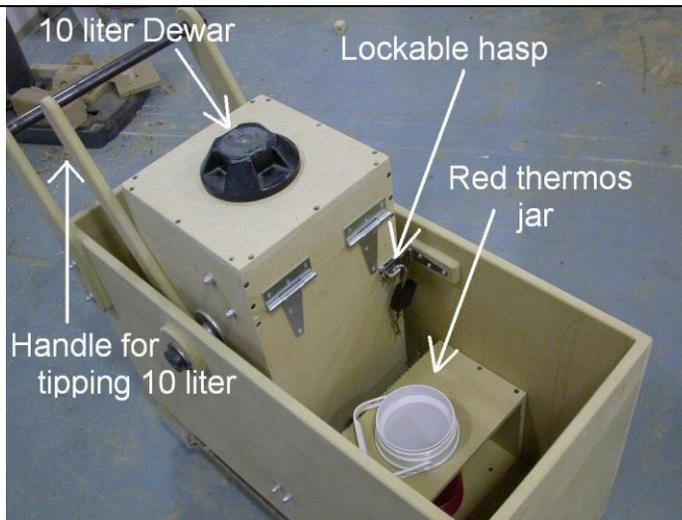
### DON'T's

- DON'T add unscripted material or anecdotes. The show will be too long or will drag.
- DON'T ever take any Liquid Nitrogen off stage.
- DON'T allow visitors on stage after the show or near the Liquid Nitrogen Dewars or any props. If you want to demonstrate something in response to a question, have visitors watch from off the stage.

## Operating the Tipping Cart

The TIPPING CART is custom-made device to make pouring Liquid Nitrogen as safe and convenient as possible.

- 1) Always keep the TIPPING CART locked when you are not physically present.
- 2) Place the empty RED THERMOS JAR into the circular hole made for it on the lower level of the TIPPING CART.
- 3) Remove the cap from the 10 liter Dewar and set it on shelf.



- 4) Wearing protective gear, slowly and carefully tilt the box containing the 10 liter Dewar so that Nitrogen flows out at a slow steady rate. Pour small amount into thermos.
- 5) After initial boil off of Liquid Nitrogen, top off the level in the RED THERMOS JAR till it is about  $\frac{3}{4}$  full. Place it against the wall to prevent accidental spillage.
- 6) Replace the cap on the 10 liter Dewar.



## **Mission Superchill Training Checklist**

Name: \_\_\_\_\_

Due to safety concerns, this show must be trained by a designated staff trainer. The trainers for this show are: Naomi Pequette, Christie Cass, Erin Prestia-Robins, Michael Parker, Andrew Parker, Amber Parham, Cat Jensen, Jose Zuniga.

Dave Blumenstock and Naomi Pequette will work to pair volunteers with staff trainers for their shifts

### **Preparation**

- \_\_\_\_\_ Liquid Nitrogen Certification with Samantha Richards or Naomi Pequette
- \_\_\_\_\_ Watch staff Superchill #1
- \_\_\_\_\_ Watch staff Superchill #2
- \_\_\_\_\_ Review training material and script on Portal

### **Training**

Please note there is no “magic number” of times each step in this process needs to be done. Please work with your staff trainer and Naomi to determine when you are ready to move on to the next step in the training process.

- \_\_\_\_\_ Blocking run-through
- \_\_\_\_\_ Do dry run (all show components without actually using Liquid Nitrogen)
- \_\_\_\_\_ Perform individual experiments
- \_\_\_\_\_ Experiment and Safety Sign-off with Naomi
- \_\_\_\_\_ Tandem Show with trainer #1 (perform experiments with minimal script)
- \_\_\_\_\_ Tandem Show with trainer #2 (reverse roles from first show)
- \_\_\_\_\_ Perform whole set-up, show, and post-show for trainer according to all safety and script requirements (without audience and with audience)
- \_\_\_\_\_ Solo Certification with Naomi (Run through set-up, show, and post show)

### **Continuing Superchill Training**

- \_\_\_\_\_ Have trainer watch 2<sup>nd</sup> solo show and give notes
- \_\_\_\_\_ Have trainer watch 8<sup>th</sup> solo show and give notes

## **STAFF ONLY SECTION**

### **CHANGING THE DEWAR IN THE TIPPING CART**

When the Dewar reaches is empty or has less than enough LN for another show, it is time to change out the Dewar for a full one.

1. Take the SUPERCHILL key from the backstage rack.
2. Roll the TIPPING CART to the STORAGE CAGE on the loading dock.
3. Using the key hung on the TIPPING CART, unlock the padlock on the cage.
4. Make sure TIPPING CART front lock is locked and secure.
5. Remove a full Dewar from the cage and set in out of the way so it cannot be tipped over.
6. Remove the lid to the Dewar and set it inside the TIPPING CART.
7. Unlock the hasp on the handle side of the TIPPING cart, and open the lid.
8. Using both hands, lift the empty Dewar straight up and set it on the floor.
9. Replace the lid on the full Dewar.
10. Tear the tag on the Empty Dewar so it says EMPTY.
11. Place the empty Dewar inside the cage behind any full Dewars.
12. Replace padlock on storage cage.
13. Using both hands, lift the full Dewar and lower it into the TIPPING CART.
14. Close the top and secure the hasp
15. Return cart to the GALAXY STAGE, remembering to SET THE BRAKE on the TIPPING CART so it will not roll backwards while you unlock the GALAXY STAGE door.
16. Replace TIPPING CART and key to their normal palaces.
17. If you take the last full Dewar from the cage, leaving all 4 empties in the cage, call Samantha Richards and ask her to order a delivery.