OCESS Procedure Manual

0.0 GUIDE AND DEFINITIONS

0.1 GENERAL GUIDE

0.1.1 General This manual may be used for both training and in-mission reference, although it is primarily designed for pre-mission training.

0.2 DEFINITIONS

0.2.1 Alpha-class emergency: An incident outside of the parameters of the Simulation.

0.2.2 Beta-class emergency: An incident within the parameters of the Simulation.

0.2.3 AYSE Drive: The power and engine unit that the Habitat docks with for interplanetary travel.

0.2.4 Mission Control: The Launch and Flight Operations control centre of the OCESS.

0.2.5 Habitat: The Hawking II, planetary transit and habitation vehicle used by the OCESS.

0.2.6 EVA: Extra-Vehicular Activity, consisting of space walks and surface excursions.

0.2.7 IVA: Infra-Vehicular Activity, consisting of moving around the interior of the Habitat in full EVA equipment. This is generally rendered necessary by environmental leaks or depressurization.

0.2.8 TCS: The Tachyon Communication System, our faster-than-light communication system; it does not need relays (i.e. TDRS satellites) due to its fundamental nature. Is composed of the TCU (Tachyon Control Unit) and TCER (Tachyon Control Emission and Reception) which are the Habitat and Mission Control devices, respectively. Tachyon collector dishes are used for reception.

1.0 Mission Control Staffing

1.0.1 Note: Although the Astronauts will not have this staffing structure, they will be completing many of the same functions. The descriptions of these functions will not be repeated for the Habitat crew, but will be detailed in the Astronauts' PCAP schedules.

1.1 FLIGHT

1.1.1 The Flight Director is responsible for all launch-time and flight-time operations and is in charge of Mission Control during all scheduled tasks and emergencies.

1.1.2 Standard Flight Procedure: Under no circumstances is the Flight Director to use his or her headset to communicate directly with the Astronauts during normal Mission Control operations. Only in the event of the CapCom officer having technical difficulty or being disabled such that he cannot speak should Flight speak to the astronauts. Finally, Flight may speak to the astronauts if in an emergency where direct clarity of the requested order is needed. All communication is the responsibility of INCO and CapCom. The Flight Director can order timetable changes, command EVA operations, authorize recommendations by other station officers, etc. However, the Flight Director's authority is overridden by direct government or OCESS Command orders issued to the Habitat Commander whenever his/her orders conflict directly with government's/Command's orders (see P5.3.1). Under no circumstances is the Flight Director to leave Mission Control during his/her shift. Whether an emergency is occurring or not, they must remain.

1.1.3 Emergency Procedure: The Flight Director is responsible for dealing with all Beta-class Emergencies and is fully within his or her authority to order a mission abort. The Mission Control Commander and Habitat Commander become responsible for dealing with all Alpha-class emergencies in Mission Control and the Habitat, respectively, overriding the authority of the Flight Director.

1.1.3.1 Acting Mission Commander: During EVAs when the astronaut mission commander is out on an EVA, a senior astronaut must be designated as acting mission commander for the duration of the mission commander's EVA. The acting mission commander must remain in the habitat until relieved by the mission commander. The acting mission commander assumes all of the duties, responsibilities, and authority of the mission commander until relieved by the mission commander's return.

1.1.3.2 Real fire emergencies: follow P4.3

1.2 CAPCOM

1.2.1 The Capsule Communications Officer is responsible for all primary voice communication with the Habitat.

1.2.2 Standard Flight and Emergency Procedure: Under normal Mission Control operations, the Capsule Communications Officer communicates all information relayed from other stations, including the Flight Director, to the Habitat CapCom. Under no circumstances is the CapCom to make independent decisions concerning launch or flight operations. The CapCom also relays the astronauts' current jobs to the Habitat at the beginning of each scheduled shift.

1.2.3 Communications Protocols: Whenever possible, the CapCom is to use the following expressions in communications with the Habitat CapCom:

Roger / Copy: Acknowledged.
Affirmative: Yes.
Negative: No.
Alpha Evacuation: Full Habitat evacuation.
Beta Evacuation: Modular evacuation.
Over: Message finished.
Over and Out: Communications finished.

1.3 INCO

1.3.1 The Instrumentation and Communications Officer is responsible for all computer-based (secondary) communications with the Habitat, as well as camera systems and the TCS.

1.3.2 Standard Flight and Emergency Procedure: The INC Officer is to constantly monitor and maintain all primary and secondary communications between Mission Control and the Habitat: the cameras AuxCom, and CapCom (TCS). This officer is also responsible for logging all significant mission events and maintaining and changing pressure in the primary airlock during docking procedures and EVAs. In all emergencies, AuxCom must be monitored closely, as CapCom could lose contact without warning.

1.3.3 Logging Procedure: All Log entries must have the current Mission Time appended to their entries The INCO incarnation of CMES should do this automatically. All CapCom messages must be logged All Experiment Data must be logged. All mission status changes must be logged All Habitat status changes must be logged. The INCO shall log, in short, all direct messages. The INCO should also be prepared to access prior entries if requested by other Mission Control or Habitat staff.

1.3.4 Airlock functionality: The INCO is to confirm Airlock pressure when required. He/she is to raise or lower pressure on the airlock. This currently involves switching workstations and watching the Airlock Computer. To raise or lower pressure press the 'p' key for pressurize, and the 'd' key for depressurize. '+' and'-' alter the rate of change. The standard rate is approximately 5.0 kPa/sec, but the rate to be used is to be approved by the Flight Director. Nominal pressure is 101.3kPa.

1.3.5 Camera Operations: The INCO must change workstations to Stonehenge when a camera change is requested. To change which camera a TV displays, he/she must right-click on the TV in the Hub display and go to Properties. He/she is then to click on the second tab, and change the 'video-on-idle' setting to the name of the camera to which he/she has been instructed to orient the display. The INCO is not to change the display without authorization by the Mission Commander or Flight Director.

1.4 EECOM

1.4.1 The Electrical and Environmental Command Console Officer is responsible for the maintenance of the lifeblood characteristics of the Habitat - electricity, LOX, LN2, etc.

1.4.2 Standard Flight and Emergency Procedure: The EECOM officer is to monitor Habitat electrical systems, pressure, gas balance, LOX, LN2, etc. Should any alarming change occur, the EECOM is to notify the Flight Director in order to make a decision regarding the change. The EECOM is responsible for then instituting remote changes to the Habitat systems as instructed by the Flight Director. S/he is not to make any changes without prior authorization.

1.4.3 Computer Interfacing Procedure: <data pending>

1.5 GUIDO

1.5.1 The Guidance Officer is responsible for all gravitational, orbital and environmental effects on the trajectory of the AYSE Drive and Habitat.

1.5.2 Shuttle Docking

All docking procedures are shuttle operation procedures except:
1) Toggle F5 to display Habitat Docking Systems
2) ID (Inertial Dampers) set to OFF
3) AG (Artificial Gravity) set to OFF
4) DH (Docking Hatch) is CLOSED
5) DHL (Docking Hatch Lock) set to LOCKED and DISARMED
6) Wait until Shuttle confirms that docking is complete
7) DHL set to ARMED then UNLOCKED
8) DH set to OPEN

1.5.3 Shuttle Undocking

All undocking procedures are shuttle procedures except:
1) Toggle F5 to display Habitat Docking Systems
2) DH set to CLOSED
3) DHL set to LOCKED then DISARMED
4) If departing from Shuttle, wait until MC confirms that Shuttle undocking is complete and minimum standoff distance attained.
5) AG set to ON
6) ID set to ON

1.5.4 Trajectory Setting Procedure and Escape Burn

1.5.4.1 Rendezvous with AYSE Drive Unit

1) Goto P1.5.11 Habitat Drive Systems to ensure that the habitat drive system is nominally functional.
2) a) Select Status: TARGET (toggle TAB key)
   b) Choose Target as the current planet you are orbiting (press key from Table 1.5.A)
3) a) Select Status: REFERENCE (toggle TAB key)
   b) choose Reference for orbital maneuvers as current planet (press key from Table 1.5.A)
4) a) Select Status: CENTRE (toggle TAB key)
   b) choose centre view point as the current planet (press key from Table 1.5.A)
5) Magnify image (+ - keys) to see the current planet clearly
6) Press F2 for automatic **ccw orbit ref** orientation.

7) If SHUTTLE undocking has just been completed, Hold further steps until ground control confirms that the shuttle has completed the de-orbit burn.

Keep Status set to CENTRE at all times to avoid inadvertent redirecting of the AYSE drive.

8) Apply 3 m/s/s thrust for the required time (consult mission control)
9) **D to targ** value should stop increasing at near the correct altitude for rendezvous.
10) Apply 2-5 m/s/s thrust until Vo ref equals Vhab-ref.

11) Toggle F5 to bring up the AYSE docking systems control panel.
12) Activate the AYSE DOCKING process.
13) Wait until docking is complete and Auto Docking indicator shows GREEN.
14) Lock and Disarm the AYSE docking latches.

1.5.4.2 Departure from Orbit

1) a) Select Status: TARGET (toggle TAB key)
   b) Choose Target as the destination planet (press key from Table 1.5.A)
2) a) Select Status: REFERENCE (toggle TAB key)
   b) choose Reference for orbital maneuvers as current planet (press key from Table 1.5.A)
3) a) Select Status: CENTRE (toggle TAB key)
   b) choose centre view point as the current planet (press key from Table 1.5.A)
4) Magnify image (+ - keys) to see the current planet clearly
5) Press F2 for automatic **ccw orbit ref** orientation.
6) Goto P1.5.12 to check status of AYSE Drive Systems

7) Examine the image and the Target Vector (grey) and the relative position of Earth and the AYSE drive to see if the Earth is masking the Target. If the Target is masked proceed to section A, if not proceed to B.

A)
8) Press F2 for automatic ***ccw orbit ref*** orientation.
9) Check AYSE status lights.
10) Check that orientation vector (red) is perpendicular to direction to earth.
11) Power up engine (Shift]) to 20.0 m/s/s
12) Power down engine to stop (BckSp key)
13) Proceed to section B

B)
14) Press F3 for automatic ***approach to target*** orientation.
15) Check AYSE status lights.
16) Check that orientation vector (red) matches the target vector (grey).
17) Power up engine (Shift]) to 50.0 m/s/s
18) Check AYSE status lights at 5 minutes.
19) Power up engines to 200.0 m/s/s
20) Check that the velocity vector (green) approaches then is superimposed over target vector.

1.5.5 Passive Thermal Control

1) Toggle F5 to AYSE Drive Systems.
2) Set Thermal Control Measures to ON.
3) Ensure that Status light shows green.

1.5.6 Rate Control

1) Monitor Acceleration to Target (*A to targ*) value periodically.

***A to targ* value must NEVER exceed 200.0 m/s/s**

2) When *A to targ* reaches 190.0 m/s/s:
   a) stop engine (BckSp key)
   b) Select Status: REFERENCE (toggle TAB key)
   c) choose Reference object to the same as TARGET for orbital maneuvers
      (press appropriate key from Table 1.5.A)
   d) Select Status: CENTRE (toggle TAB key)
   e) choose target as centre view point object (press appropriate key from Table 1.5.A)
3) Press F4 for automatic ***depart from ref*** orientation.
4) Check that orientation vector (red) is opposite from target vector (grey).
5) Check reactor, engine, AG, and ID status lights.
6) Power up engine to 200.0 m/s/s
7) Hold maximum engine thrust until *A to targ* shows 190.0 m/s/s
8) Adjust engine thrust ([and] keys) until *A to targ* stabilizes at 190.0 m/s/s

9) Monitor *A to targ* value periodically to ensure that it is stable.

10) Monitor velocity vector (green) and target vector (grey) periodically to ensure that they are superimposed. If the AYSE drive is coming out of alignment, do the following:

a) Press F1 for manual ***orientation*** control

b) rotate the orientation vector *slightly* in the opposite direction from the deviation of the velocity vector: One key click is a one degree change. 5 degrees should be sufficient for most purposes.

Home key for clockwise rotation

PgUp key for counter clockwise rotation

c) Adjust the thrust up (] key) to maintain the *A to targ* value at 190.

d) When the velocity vector is satisfactory, press F4 for automatic ***depart from ref***.

e) Adjust the thrust ([and] keys) to stabilize *A to targ* at 190.

11) As you get to within a few million kilometres of the target, increase thrust to reduce *A to targ* to give yourself a better margin of safety then reduce thrust to stabilize it again.

1.5.7 Orbital Insertion from Approach

1) Press "v" to display target approach velocity vector on the main display.
2) a) Select Status: REFERENCE (toggle TAB key)
   b) choose Reference object to the same as TARGET for orbital maneuvers
   (press appropriate key from Table 1.5.A)
3) a) Select Status: CENTRE (toggle TAB key)
   b) choose target as centre view point object (press appropriate key from Table 1.5.A)
4) Adjust the approach velocity vector to approach the target slightly to the right side (for a ccw orbit).
   a) Press F1 for manual orientation.
   b) rotate the orientation of the AYSE drive to alter the approach velocity vector.
   c) manually re-orient the AYSE drive in the opposite direction to stabilize the approach velocity vector.
5) The A to targ value will now read a bit low and will become more inaccurate the closer you get to the

target since you are no longer moving directly towards it.
6) Your goal is adjust thrust to slow the Vhab-ref to the Vo ref velocity by the time your approach velocity vector is perpendicular to the direction to the target. When this is achieved:

i) stop the engine (BckSp key)

ii) You are now in orbit.

7) Ensure that the Reference object is the same as the target.
8) Press F2 for automatic ***orbit ref*** orientation.

1.5.8 Orbital Maneuvering

1) a) Select Status: REFERENCE (toggle TAB key)
   b) choose Reference object to the current planet (press appropriate key from Table 1.5.A)
2) Press F2 for automatic ***orbit ref*** orientation.
3) a) To decrease orbital distance, briefly fire the reverse engine (press [key then BckSp key to stop). This will lower the height of the orbit on the other side of the orbit.
   b) When at the low point of the orbit, set –2 to -5 m/s/s thrust to reduce Vhab-ref to Vo ref

4) a) To increase orbital distance, briefly fire the forward engine (press] key then BckSp key to stop). This will increase the height of the orbit on the other side of the target.
b) When at the high point of the orbit, set 2 to 5 m/s/s thrust to increase Vhab-ref to Vo ref

1.5.9 Landing Procedure

1) a) Select Status: TARGET (toggle TAB key)
b) Choose Target as the current planet (press key from Table 1.5.A)
2) a) Select Status: REFERENCE (toggle TAB key)
b) choose Reference for orbital maneuvers as current planet (press key from Table 1.5.A)
3) a) Select Status: CENTRE (toggle TAB key)
b) choose centre view point as the current planet (press key from Table 1.5.A)
4) Magnify image (+ - keys) to see the current planet clearly

5) Toggle F5 to bring up the AYSE docking systems control panel.
6) Arm and Unlock the AYSE docking latches.
7) Activate the AYSE UNDOCKING process.
8) Wait until undocking is complete and the Auto Docking status shows RED.
9) Set Thermal Control Measures to OFF.
10) Press _v_ key to activate the approach velocity vector if not done already.
11) Fire the reverse engine (use a low thrust setting (-1 to -5 m/s/s) until the approach velocity vector points directly towards the centre of the target.
12) Press F4 for automatic ***depart from target*** orientation.
13) Press F1 for manual orientation.
14) Increase thrust (regular thrust (positive) not reverse thrust) using] key until the *A to targ* matches the engine thrust.

15) Increase engine thrust to slow Vhab-ref speed to something appropriate (a value of about 10% of the distance value (*D to targ*) may work).
16) Reduce thrust to match *A to targ* value.
17) If the landing is taking too long, adjust thrust to increase Vhab-ref, but this make it harder to stop.

If A-targ value exceed 50 m/s/s then:
@ Low Altitude: maintain maximum thrust and brace for hard landing
@ High Altitude: Initiate Landing Abort Procedure P1.5.13

18) If the approach velocity vector starts to point away from the centre of the target, rotate the AYSE drive slightly in the opposite direction to correct it then re-adjust the orientation to stabilize the approach velocity vector.
19) As you get closer to the target, gravity will increase the *A to targ* value and you must increase thrust to match it.
20) As you get closer to the planet, use increased thrust to slow down and readjust thrust to match *A to targ*.
21) When distance reads 0.00, stop engine.

1.5.10 Planetary Launch Procedure

1) Follow procedures in 1.5.3 and 1.5.4 steps 1 to 5
2) Select the current planet as reference and target object (see section 1.5.4)
3) Press F4 for automatic ***depart from target*** orientation.
4) press _v_ to activate approach velocity vector.
5) Increase thrust to exceed local gravity by at least 1 m/s/s and AYSE drive will lift off.
6) Adjust thrust to maintain the desired lift-off speed.
7) Press F1 for manual orientation control.
8) Gradually rotate the AYSE drive counter-clockwise until the orientation is perpendicular to the direction back to the planet.
9) Press F2 for automatic ***ccw orbit ref*** orientation.

10) If the approach velocity vector is pointing away from the planet:
    press F3 for automatic ***approach to targ*** orientation.
    Use slight thrust to restore correct approach velocity vector.

11) If the approach velocity vector is pointing towards the planet:
    press F4 for automatic ***depart from ref*** orientation.
    Use slight thrust to restore correct approach velocity vector.

12) Press F2 to restore automatic ***ccw orbit ref*** orientation.

13) If Vhab-ref is less than Vo ref, use positive thrust to increase Vhab-ref.
    If Vhab-ref is more than Vo ref, use reverse thrust to decrease Vhab-ref.

14) Stop engines.

1.5.11 Habitat Drive Systems

1) Toggle F5 for Habitat Drive Systems
2) Check automatic REACTOR SYSTEMS show GREEN
3) Check that all ION DRIVE status lights show GREEN
    b) IONIZING VOLTAGE
    c) ACCELERATION VOLTAGE
    e) CHARGE BALANCE
    f) TEMPERATURE

1.5.12 AYSE Drive Systems

1) Toggle F5 for AYSE Drive Systems.
2) Check that the following systems show GREEN
    a) TTC
    b) GPDs
    c) Generator Voltage
    d) Systems Temperature
    e) Battery Charge

1.5.13 High Altitude Landing Abort

1) Press F2 for automatic **ccw orbit ref** orientation.
2) Press F1 for manual orientation
3) Re-orient the habitat slightly towards the planet to help build up speed
   (The orientation should clear the planet)
4) Apply maximum thrust until insertion to orbit looks possible.
5) Go to P1.5.10 steps 6 and on.

2.0 Habitat General Procedures

2.1 EVA

2.1.1 EVA: Extra-Vehicular Activity. An astronaut puts on a self-enclosed environment suit, which is able to withstand the near-vacuum of space, the heat of solar wind (resistant to ionizing plasma charges of roughly 13,000V), radiation (reduction factor of the EVA suits is approximately 1:10,000), and most other unwanted hostile conditions. Defeating the suit's radiation protection while in a near-vacuum environment can result in skin bums, internal burns, blindness, sterility, and death.

2.1.2 EVA suit preparation: Astronauts will need assistance in putting on the EVA suits. They should first take off as much unnecessary clothing as possible. Any supplies or equipment on their persons should be transferred to the EVA suits. They must first put on any inner layer the EVA suits may have. Then the full body suit should go over top. Turn on the main power. Insert any cooling packs and activate any fans. Close the outer suit layer with clips or clamps (if applicable), covering over sealing points with Velcro flaps. Ensure that there are no leaks. Place the boots over the astronauts' feet, and seal them as tightly as possible into the legs, clamping them in place (if applicable.) Use duct tape if necessary. Repeat this with the gloves. Duct tape should be limited to once around, as excessive use can slow de-suiting. Attach any equipment the astronauts will need to the outside of the suits. Standard equipment is as follows: flashlight, duct tape, sample containment box, and headset. Attach the headset to the EVA suit, and turn it onto voice activation (VOX) mode. If necessary, use hair clips or duct tape to attach the headset firmly onto the astronaut's head. Finally, after receiving the final go-ahead from Mission Control, attach the helmet onto the suit. Make sure there are no air leaks.

2.1.3 Leaving the Habitat: Once the EVA suits are complete and sealed, the Astronauts are to obtain clearance from Mission Control to enter the airlock. Once inside, they are to close the door behind them, and ask Mission Control to depressurize the airlock. Watch the airlock lights for clearance to leave. Mission Control will give the go-ahead to open the outer door. Leave through the door.

2.1.4 Entering the Habitat: Once finished the EVA, approach the airlock. Check with Mission Control that it is indeed safe to open the airlock if it is now closed. Once informed it is safe, open the airlock and enter. Close the door behind you, and ask Mission Control to start pressurizing the airlock. Watch the airlock lights for pressure, although you must wait for confirmation from Habitat or Mission Control. Open the inner door and enter the Habitat. Any samples should be taken directly to the Hotlab

by one of the other astronauts. The EVA suit should be swiftly removed in the reverse procedure from putting it on.

2.1.5 Surface Activities: EVAs have four purposes: exploration, repair, emergencies, and scientific research. While exploring on an EVA, astronauts should describe what they see so that it may be recorded in Mission Control, and pick up any samples that they believe are of interest. While out on scientific research, the EVA usually will have a mission protocol, so the astronauts should run through whatever this procedure is. It can vary from setting up equipment, to gathering data, to whatever they may be interested in researching for the Mission. Emergency EVAs usually have a specific purpose. Often this is to go out and survey damage to the habitat. Sometimes they must repair damage or retrieve broken parts of the Habitat. In the worst case, they may be out on the surface to rendezvous with an emergency supply probe. A repair EVA is often a standard EVA to check and do maintenance to the Habitat, which is often hit by small meteorites; potentially threatening dents need to be repaired. _Emergency supply probes must be requested at least a day in advance, since the travel time is significant. Only call on such a request if something extremely critical is required and in a significant quantity. These probes are expensive to send up. "Space Sim Archives."

2.1.6 Astronaut Recovery: Once an astronaut has completed his/her EVA, biomeds should be taken (P2 53) and transmitted back to Mission Control. Ensure that the astronaut has not suffered from any adverse conditions (heat stroke, exhaustion, suffocation, etc.) Give the astronaut time to rest, as an EVA is very tiring. Also, have a glass of cold liquid ready to give them as soon as they get out of the suit. This may sound trivial, but if you're in an EVA suit, you'll understand.

2.2 IVA

2.2.1 IVA: Intravehicular Activity. An astronaut puts on a self-enclosed environment suit, but instead of leaving the Habitat, uses it inside.

2.2.2 IVA suit preparation: The IVA suit is an EVA suit. Don the EVA suit as outlined in P2.1.2

2.2.3 Moving around the Habitat: When entering or leaving a module, ensure that opening the door will not pose a risk to the other Astronauts. Mission Control will inform you as to whether or not it is safe and what the other astronauts must do to ensure they are safe. Try to limit unnecessary movement to avoid overheating.

2.2.4 IVA activities: If you are performing an IVA, it is due to unforeseen circumstances. There may be loose, live wires. A module may have been depressurized. You may need to enter an area full of high radiation. Follow Mission Control's instructions carefully. Don't worry, your EVA suit should protect you from all hazards. If communication with Mission Control is broken, try to re-establish it as soon as possible.

2.2.5 Emergency IVAs/EVAs: During most emergency IVAs/EVAs, contact with Mission Control is sketchy at best. Keep this in mind.

2.3 EXPERIMENTS

2.3.1 Experiment: Any activity of which the purpose is to retrieve data and send it back to Mission Control.

2.3.2 Procedure: Experiments will have specifically detailed procedures that will produce results (success or failure, plus data.) These results should then be transmitted back to Mission Control.

2.3.3 Transmission of Results: The current astronaut on CapCom should announce that the experiment results are being sent. The INCO astronaut will then type the results through AuxCom to ensure reliability of transfer. Mission Control will take down these results onto a safe file. A hard copy of the results is also preferable in case of system failure.

2.4 HOTLAB

2.4.1 Hotlab: The Habitat's self-contained laboratory. It is used to perform experiments that would possibly pose a risk to the safety of the astronauts if they were performed in the open due to contaminants.

2.4.2 Preparation: The astronaut performing the experiment will suit up in a biohazard suit (or, if none are available, an EVA suit). Follow the procedures outlined in P2.12[EVA suit preparation]. For all intents, a Hotlab experiment can be considered a non-emergency IVA (as outlined in P2.2[IVA]). Note: The Hazard Suit is not necessary if you are simply passing through the Hotlab, but is necessary if you touch (or plan to touch) anything within the room.

2.4.3 Experiment Procedure: Experiments may be performed using the procedure outlined in P2.3[Experiments], with added precautions taken to minimize the possibility of a hazardous material being spilled. Environmental conditions in the Hotlab should be constantly examined to reveal the effects, if any, of the materials.

2.4.4 Completion: The astronaut will return to the Habitat only once all possible hazardous materials have been sealed off. Experiment results should be transmitted to Mission Control as outlined in 2.33[Transmission of Results], If there is any chance that the astronaut was exposed to hazardous materials, he/she must be quarantined under P2.56 and monitored.

2.4.5 Hotbox: The Hotbox is the Hotlab's small containment unit. Samples are to be placed (still inside their containment box) into the door on the right. This door must be shut before the inner door is opened. The Astronaut is to then place his or her hands into the arms of the Hotbox. He or she is to open the inner door and retrieve the sample. It is safe to open a sample inside the Hotbox. There are a number of cabinets inside the Hotbox. The Astronauts should be aware of where they can keep samples, and where the chemicals they'll need are located. Samples are only to leave the Hotbox inside a containment box or after they have been determined benign.

2.4.6 Sample Tests: Samples may be tested in the following ways:
2.4.6.1 Acidity Test. Complete a simple pH test on the sample. Strongly Acidic or Basic substances

should remain in the Hotbox. The Hotbox should be stocked with the appropriate supplies prior to launch.

2.4.6.2 Microscopic Analysis: Samples can be removed from the Hotbox, if safe, and viewed under a microscope. No procedure is given for making slides, as all the astronauts are well-trained scientists and should know how to do so.

2.4.6.3 Radiation Test: If available, a Geiger counter may be used to check radioactivity. Radioactive substances should not leave the Hotbox without mission control clearance.

2.4.6.4 Luminescence Test: Shine bright lights onto the samples to see if they react to light in any way.

2.4.6.5 Durability Test: Attempt to break the sample (if solid) with your hands or small objects. Only do this within the Hotbox as unknown gases may be released from the centre of the sample.

2.5 BIOMEDICAL ASTRONAUT READOUT AND ASTRONAUT MAINTENANCE

2.5.1 Description: The astronauts must maintain perfect physical health throughout the mission.

2.5.2 Cycling: All astronauts must cycle for at least half an hour per day. This will be scheduled by the Mission Commander. They may cycle at whichever pace they can maintain but are encouraged to push themselves. The Astronauts are to have their biomeds (P2.53) taken before and after the cycling as well as one other time during the day.

2.5.3 Biomeds: If the astronauts must take their 'biomeds' this means they must check their blood pressure and pulse. Strap apparatus to arm. Turn the blood pressure apparatus on, push ready, then remain as still as possible until the check is complete. Let the apparatus pressurize, wait for the apparatus to get readings, get readings of screen on apparatus.

2.5.4 Nutrition: The Astronauts must be properly nourished. They are to eat three meals a day. All food is predetermined before the mission. Available 'snacks' are also predetermined. No extra food is to be brought on the mission. Food will be prepared in advance of the appointed time of ingestion (duty Scheduled by Mission Commander) and cleaned up by other astronauts afterwards.

2.5.5 Fatigue: Fatigue levels should be kept to a minimum. The astronauts do have an appointed time each day at which they are supposed to sleep. Recommended sleep time: 8 hours. Mission Control will not enforce this, but they will also not tolerate fatigue problems on the next day.

2.5.6 Quarantine: If an astronaut is ill, or is hurt, he/she is to be quarantined. The Hotlab is ideal for this purpose, as it has a decontamination field. If the astronaut is required to move around or participate in group activities, he or she is to put on an EVA suit, so that he or she remains in an isolated environment.

3.0 General Emergency Reference Procedures

3.1 HABITAT ELECTRICAL

3.1.1 Power Failure (complete): Follow P4.22(Beta Evac Only), and then consult Tech Specialist or P4.73(Total Power Restoration).

3.1.2 Power Failure (single module): Evacuate affected module immediately, then consult Tech Specialist or P4.72(Module Power Restoration).

3.1.3 Repetitive Power Loss: Initiate P4.23 (Beta Isolation). The Habitat Commander and Tech Specialist will gather in the Interlock, and follow P4.75(Repetitive Breaker Tripping)

3.1.4 Arcing or Sparks: Initiate P4.23 (Beta Isolation). Contact Mission Control and proceed with P4.32 (Alpha Extreme Hazard Evac) unless cleared to follow P4.74 (Terminating Power). Once power is terminated, the situation will be assessed. P4.31 (General Alpha Evac) may be ordered depending on the affected module.

3.2 HABITAT ENVIRONMENTAL
3.2.1 Minor Fire: Follow P4.1 (Habitat Fire Control), followed by P4.31 (General Alpha Evac) if deemed necessary by the Habitat Commander. 3.2.2 Major Fire: Follow P4.34 (Alpha Evac and Sealing) if reasonable.

3.2.3 Radiation: Follow P4.21 (General Beta Evac).

3.3 HABITAT ELECTRONIC <data pending>
3.3.1 Control Panel
3.3.2 Computer Systems and Secondary Communications (INCO)
3.3.3 Cameras 3.3.4 Primary Communications (CAPCOM)

3.4 HULL BREACHES
3.4.1 Identification of Hull Breaches: Hull breaches may be identified through either visual inspection of the hull or pressure drops in any parts of the Habitat monitored by CMES. The fundamental principle of hull breaches is that it is better to be safe than sorry: any suspicion whatsoever of a hull breach should be initially treated as a definite atmospheric leak until it is proven otherwise.

3.4.2 Immediate Reaction: Follow P4.21 (Beta Evac.)

3.4.3 Hull Breach Sealing: Two astronauts, if possible, must go on an EVA (P2.1) as soon as the situation permits. They must take all necessary repair equipment (tools, aluminum tape, spare patching materials, and fastening materials.

3.5 COMMUNICATION PROBLEMS
3.5.1 Total Failure: Communications may have been disrupted by ion, lightning, or sand storms on the planetary surface. If this is the case, attempt to re-establish contact at thirty seconds Communications should be possible once the storm has abated. If lost after a meteor strike or shower, it is likely that the TCS dish has been damaged. Once you are certain the meteor shower is over, an EVA (P2.1) should be performed to examine the dishes and repair them if necessary.

3.5.2 Cap Com Failure: Attempt to maintain contact via AuxCom. Check your headset's batteries. Interference or disruption may be due to storms or meteors, as outlined in P3.5.1. Attempt to re-establish contact once every thirty seconds.

3.5.3 Visual Link Failure: If a single camera or TV goes down, it is most likely faulty. Push the orange button on its console. Failing this, contact Mission Control for the resident Camera Specialist (usually Tech Director or Camera team member) and receive instructions for replacement. If all the cameras go down, check the TCS dish as in P3.5.1

3.5.4 Auxcom Failure: If Auxcom goes down, but Capcom is still online, it could be a network packet error. Interplanetary networks have a good chance of losing large numbers of network packets. Co-ordinate with Mission Control to re-establish the link through INCO (or telnet and talk if INCO is not working).

3.5.5 Total Message Loss: If Capcom and Auxcom are down, use the Cameras and hand sianals to inform mission control of your situation. Write on paper and hold it up. The Flight will give a "thumbs up" if he can understand or "thumbs down" if he cannot. Mission Control is to respond in a similar manner, writing on paper. If prolonged loss of messages occurs, the Camera System can be rigged for audio transmission, but this should be avoided at all costs, as the connection is bad and causes feedback.

3.6 NAVIGATION ERRORS
See P 1.5.6 step 10

4.0 Emergency Action Procedures
4.1 HABITAT FIRE CONTROL
4.1.1 Habitat Fire Control (General): Inform Mission Control by any method possible. If the fire is localized in one small area, initiate a Beta Evacuation and seal off that area (P4.2.1) Use fire extinguishers on small fires (P4.1.1.1 A). If the fire appears life-threatening (P4.1.1.1 A&B), the Mission Commander will declare an Alpha-class Emergency. This is to be relayed to Mission Control as soon as possible. Immediately follow a total evacuation of the Habitat (P4.3). If the Mission Commander believes there is time she will perform P4.34 (Evac and Sealing) but all other astronauts are to perform P4.31 (General Alpha Evac)

4.1.1.1 Fire: Real Fire Emergencies, outside the parameters of the simulation exercise fall into two classes: small fires and large fires. The decision to treat any fire as small or large must be made immediately. Either the astronaut mission-commander, flight director, mission control commander, or teacher advisor (or designate) can impose a large fire designation on an emergency situation. Once declared a large fire, an emergency can not be re-classified.

A) **Small Fires** can be extinguished using the fire extinguishers in the habitat.
The decision to do this must be made immediately; if there is any uncertainty, the emergency is to be classed a large fire. Any fire at an emergency exit or near the power control box will be

treated as a large fire. If more than one extinguisher fails to operate or if the extinguishers fail to extinguish the fire, the emergency will be re-classified as a large fire.

A small fire drill must be held during the outward leg of the mission to familiarize all astronauts with the proper use of the fire extinguishers.

When fighting a fire: aim the fire extinguisher near the base of the fire, trigger the extinguisher, move the exhaust of the extinguisher back and forth across the base of the fire until it is out.

B) Once a **Large Fire** is declared,

1) a general evacuation will be initiated (P4.3)
2) the building's fire alarm will be activated.

4.2 HABITAT BETA EVACUATION

4.2.1 (GENERAL) Procedure: All Astronauts are to immediately move to a non-endangered module, preferably the Interlock, or a module as close to the Interlock as possible, sealing all doors and hatches behind them to minimize the number of endangered modules. Under no circumstances should Astronauts be split into groups except (a) to conduct IVAs/EVAs or (b) when rendered impossible when Astronauts are separated by depressurized or otherwise endangered modules.

4.2.2 (EVACUATION ONLY) Procedure: Terminate all activities immediately.

4.2.3 (ISOLATION) Procedure: Terminate all activities immediately. All Astronauts must remain in their current modules and under no circumstances are they to move. Astronauts should sit on the floor and avoid any contact with the rest of the hull. The Habitat Commander will enter the Interlock only when cleared to do so by Mission Control.

4.3 HABITAT ALPHA EVACUATION

4.3.1 GENERAL Procedure: This is a full evacuation of the Habitat modules. All astronauts are to exit immediately by way of the predetermined escape routes. **The teacher advisor or designate shall be the last to evacuate.**

4.3.1.1 Primary Evacuation Routes:

Mission control: out the door to the hallway, turn to the right, up the stairs and out the door.

Longhouse & Washroom: out the longhouse exit door, turn right, up the stairs and out the exit door.

Interlock: out the airlock door, straight ahead, two right turns past the longhouse exit, up the stairs and out the exit door.

HotLab:

Hotlab Fire: exit via interlock.

Other Fires: push out the break-away wall, proceed through the opening, three left turns around the interlock to the stairs, up the stairs and out the exit door.

4.3.1.2 Secondary Evacuation Routes:

Mission control: for fires in the hallway area, proceed through the door by the file cabinet and follow hotlab escape route or proceed through the door by the network tower and follow the interlock escape route.

Habitat:

Fires in the Habitat: alternate exits from the habitat may be selected based on the location of a fire. Follow the appropriate evacuation route for a given exit.

Fires outside the habitat near the exit door: from the habitat exit, proceed into mission control via the nearest door and follow the mission control evacuation route.

4.3.2 EXTREME HAZARD Procedure: Evacuate Habitat by the closest route, avoiding any damaged, malfunctioning, or contaminated modules, taking extreme care to not touch the hull at any time.

4.3.4 EVACUATION AND SEALING Procedure: As each module is evacuated, it is to be sealed off from the rest of the Habitat, taking care to not obstruct other astronauts' escape routes. The Mission Commander is then to terminate all power systems (P4.75), and proceed with evacuation P4.31.

4.4 ASTRONAUT ILLNESS/INJURY

4.4.1 GENERAL Procedure: In the case of a non-life-threatening injury or illness, keep the affected astronaut(s) comfortable and attempt treatment as applicable. In the case of a life-threatening injury or illness, the mission will be aborted. Mission Control should be notified about all injuries or illnesses.

4.4.2 INJURY Procedure: Apply first aid and reduce the astronaut's responsibilities as necessary.

4.4.2.1 Puncture Wounds: Clean the wound and bandage it once it has stopped bleeding.

4.4.2.2 Skin Irritation: Locate and remove the cause of the irritation. Rinse the affected area with cool water.

4.4.2.3 Sprains, Strains and Bruises: Apply ice and elevate the injury if possible. Try to avoid using sprained limbs.

4.4.2.4 Heat Exhaustion: Heat exhaustion is caused by exercise or work in a hot environment and may be recognized by the following symptoms: slightly elevated body temperature - cool, moist, pale or red skin; headaches; nausea; and dizziness, weakness, or exhaustion. Tell Mission Control immediately. Have the casualty rest in a cool place. Give him or her cooled water and apply cool, wet cloths to their skin. Loosen any tight clothing and remove perspiration-soaked clothes.

4.4.2.5 Heat Stroke: If heat exhaustion is not treated immediately, it may develop into heat stroke which is much more severe. Heat stroke can be recognized by high body temperatures, often as high as 41 C (106 F); red, hot, dry skin; irritable, bizarre, or combative behaviour; a oroaressive loss of consciousness; a rapid, weak pulse becoming irregular; and rapid shallow breathing. The treatment is the same as for heat exhaustion. Tell Mission Control immediately if you have not done so_

4.4.3 ILLNESS Procedure: Treat the symptoms.

4.4.3.1 Contagious Illness: At the time a contagious illness is discovered, it is highly probable that all the astronauts have already been infected. Nonetheless, attempt to slow the spread of the disease by isolating the patient as much as possible. Use quarantine procedure P2 56 Use the Hotlab as the isolation chamber if the decontamination field is working.

4.4.3.2 Life-threatening Illness: If an astronaut is exhibiting life-threatening illness, they must be evacuated. A Beta-class mission abort (P4.63) must be initialized. The habitat is to return to Earth at full speed, burning out the AYSE drive if necessary. Mission control should call EMS such that it arrives just prior to landing.

4.4.4 Serious Illness/Injury: The astronaut is to be placed in the emergency evacuation module. These devices are small and tubular. From inside the airlock, the astronaut enters the evacuation module which will arrive from below the Habitat. It will then fly and dock directly with the AYSE drive, where it will use a simplified form of the SLINCE drive to accelerate towards Earth A coil in Earth orbit will catch the probe, and it will land just outside Mission Control. EMS should be called so that it arrives in time for the probe landing. _The last time an emergency evacuation probe was used was the liquid-nitrogen falling on the foot incident. This occurred sometime before 1996. "Space Sim archives."

4.5 HABITAT CONTAMINANT CONTROL

4.5.1 Contaminant General: A contaminant is anything degrading the quality of the environment of the Habitat. Usually it is in the form of dangerous chemicals, air-born or liquid. In all cases, avoid direct contact with the contaminant. The Module containing the contaminant should be sealed Evacuated and Sealed P4.21. Mission Control is to run analysis of the situation and locate the source of the problem. Astronauts should expect an IVA request from Mission Control.

4.5.2 Liquid Contaminant: The Astronauts should suit up for an IVA once cleared by Mission Control All other astronauts should exit to a module not adjacent to the contaminated modules). They are to seal themselves in said other module. The astronauts in IVAs are then to open the contaminated module. If realistic, a sample of the contaminant should be taken for later study. The Astronauts should then clean the spill and rectify the situation as directed by Mission Control.

4.5.3 Gaseous Contaminant: If there is a gaseous contaminant, the affected module(s) are to be vented by the Astronauts through the control panel. Once all traces of the contaminant are out of the air and Mission Control confirms, the astronauts are to then re-pressurize the module. If the astronauts cannot reach the Control Panel, Mission Control may assume these tasks. Before entering a module just cleaned, five minutes should be taken to assure that the gaseous contaminant does not return. If it does, an IVA may be needed to fix the source before venting can commence. If there is a liquid contaminant that is producing the gaseous contaminant, IVA suits will be needed clean the Liquid Contaminant P4.52 first.

4.6 HABITAT MISSION ABORT

4 6.1 General: If a Mission Abort is declared, the Astronauts must verify this with a code word hidden in the Habitat. The Mission Commanders will know the code word ahead of time, and they may also be used to confirm the word. The type of Abort must also be specified.

4.6.2 Alpha Mission Abort: If an Alpha Abort is declared, the astronauts can leave the Habitat and walk to Mission Control.

4.6.3 Beta Mission Abort: If a Beta Abort is declared, the Astronauts must immediately Launch off the planet, dock with the AYSE Drive, and return to Earth in the most speedy fashion possible. Mission Control must continue to monitor their progress and prepare a shuttle launch to rendezvous with them when applicable.

4.7 BREAKER PANEL OPERATION

4.7.1 GENERAL: Consult with a Tech Specialist or Tech Director for guidance.

4.7.2 RESTORING POWER (single module): Check the habitat GFCI breaker for the affected module. Press the black trip button then the red reset button. If the habitat GFCI breaker does not trip but the power does not come back on, attempt to determine and remove the cause of the overload. This may include excessive amount of operative electrical devices on one circuit. Contact MC for remote restoration of power at the main breakers.

4.7.3 RESTORING POWER (entire habitat): If the GFCI breakers have not been tripped, follow P4 23 (Beta Isolation) and inform Mission Control of the situation. Mission Control will inform you as to the nature of the emergency and might order P4.32 (Alpha Extreme Hazard Evac).

4.7.4 TERMINATING POWER: If the situation permits, shut down all electronics in the module(s) to be powered down. Then trip the GFCI breaker using the black button.

4.7.5 REPETATIVE BREAKER TRIPPING: The circuit is overloaded or potentially damaged. Terminate power to the circuit and remove (unplug) all electronics from the circuit. Follow P4.72 and wait If the breaker trips again, the module is to be sealed for the remainder of the mission. Mission Control may order P4.31 (General Alpha Evac) at the discretion of the Commanders and Tech Director.

4.8 MUTINY & HIJACKING

4.8.1 MUTINY/Hijacking: A person, or a group of people, take control of the Habitat. This may be Mutinying Astronauts or Hijackers. Mission Control is to immediately get in contact with the hijackers/mutineer. They must negotiate with these people. Supply their demands: you must get the Mission Commander and the Habitat back to Earth in one piece.

4.8.2 Mutiny: Try to convince them to stand down. You may have to threaten the mutineers. If the Mission Commander is dead, or segregated, offer to lower oxygen levels in their module. Attempt to gain complete remote control of the Habitat. Seal off the interlock. Offer to inject radiation into the Habitat. Once returned to Earth, the mutineers are to be taken into custody regardless of what occurs. If absolutely necessary, detonate the Habitat (P4.84)

4.8.3 Hijacking: If another party boards the Habitat, and you cannot negotiate with them. Mission Control is to aid the Astronaut remotely to retake the Habitat by force, if viable. Seal off the Interlock. Gain complete remote control of the Hab. Attempt to vent or depressurize modules with hijackers, if it doesn't affect the astronauts. If in space, deactivate the 3DMI to remove artificial gravity. If the astronauts are dead, follow P4.84.

4.8.4 Habitat Self-Destruction: If there is no way to return the Habitat and/or the Mission Commander and loyal astronauts are dead, activate the self-destruct circuit. Only the Mission Commander on Earth will know the activation code. He is to send it on a coded signal to the AYSE drive, which will seek out the Habitat if separated, autodock, and detonate.

4.9 INSTRUMENTATION

4.9.1: Instrumentation failure, replacement, and general problems

4.9.2 Instrumentation Failure: If an instrument is broken or not reading correctly, run diagnostics upon it. I fit is software or control panel, consult with Mission Control, the Mission Commander, or someone knowledgeable in the computer system about how to repair. Generally speaking, someone in MC should know how to replace any broken instrument, and they will all have their own replacement procedure. This will be covered during Astronaut and/or Flight Team Training each year.

4.9.3 Instrument Replacement: If an instrument cannot be repaired, it should be replaced. Find the spare in the Emergency Repair Kit, and attach it where needed in the same form that the original was attached. Consult Mission Control and your Astronaut or Flight Team Training for replacement of parts.

5.0 Discrepancy Procedures

5.1 ASTRONAUT REPORTS HAZARD

5.1.1 In Contradiction to Instruments: When an astronaut reports a hazard in contradiction to instruments, believe the astronaut. Proceed to react according to reported hazard. After the reported hazard has been remedied, proceed with the instrument re-calibration procedure (pending).

5.1 2 In Contradiction to Video Feed: When an astronaut reports a hazard in contradiction to video feed believe the astronaut. Proceed to evacuate astronauts from the hazard location. Attempt to verify hazard on video feed. If you can identify the hazard on video, proceed as normal. If you cannot identify the hazard on video follow P5.11 with the exceptions that follow.

When the astronauts go on repair EVA, ensure that the EVAs locate the hazard for Mission Control visually on camera. If Mission Control can identify the hazard on camera, treat the situation as a standard repair EVA with no follow up. If Mission Control cannot identify the hazard on camera, treat the situation as a standard repair EVA. but follow up with a camera check. In both cases, no instrument recatibration should be necessary.

5.1.3 In Contradiction to Mission Control Staff: When an astronaut reports a hazard in contradiction to Mission Control Staff, verify that this is not another situation. If it is 5.13, believe the astronaut Proceed to react according to the reported hazard. After the hazard has been remedied, explain to the Mission Control Staff that they are not in the habitat.

5.1.4 In Contradiction to Another Astronaut: When an astronaut reports a hazard in contradiction to another astronaut report, evacuate astronauts from the hazard situation. Immediately attempt to determine if this is another situation. If it is not, proceed as if the hazard is real unless the reporting astronaut changes his statement and provides a reason that it was incorrect.

5.2 INSTRUMENT REPORTS HAZARD

5.2.1 In Contradiction to Astronaut: When an instrument reports a hazard in contradiction to an astronaut opinion, believe the instrument, and evacuate the astronauts from the hazard situation. The first EVA should be a hazard location/instrument repair EVA. The EVA should first attempt to determine if a hazard exists which corresponds to the instrument reading. If no such hazard exists, the EVA should attempt to perform the instrument replacement procedure (pending) on any instruments that may be malfunctioning.

5.2.2 In Contradiction to Another Instrument: When an instrument reports a hazard in contradiction to another instrument, evacuate the astronauts from the hazard location, and send an investigative EVA to determine if a hazard exists. If no hazard exists, call instrument failure procedure (pending)

5.3 ORDERS ISSUED BY GOVERNMENT OR OCESS COMMAND

5.3.1 Flight Director's response: The Flight Director must comply with orders issued by the government or OCESS Command, once they have been confirmed between the Habitat Commander and Mission Control Commander by means of activation codewords. The Flight Director may issue orders that aid or do not hinder government's/Command's orders, but will be overridden at the discretion of the Habitat Commander when the orders conflict directly.

5.3.2 Habitat Commander's response: The Habitat Commander must confirm any orders issued by government/Command with the Mission Control Commander by means of an activation codeword written on the orders and known only to the Mission Control Commander. Should the Flight Director's orders directly conflict with the written orders, once confirmed, the Habitat Commander is entitled to override the Flight Director, only for the purpose of completing the orders. Authority reverts to the Flight Director once the orders are carried out or the orders are no longer in conflict.