

ASEN 5158 Homework 2

Assigned Tuesday November 4, 2008

Due Tuesday November 11, 2008

Note: This is the first in a series of incremental homework assignments that will cumulatively build on each other in determining the life support system mass and habitable volume needed for a human mission to Mars.

Reference: NASA Advanced Life Support Baseline Values and Assumptions Document (BVAD), NASA/CR-2004-208941, August 2004

1. Determine the total mass of metabolic consumables (oxygen, water and food) that would be needed to support a crew of 4 on a trip to Mars for the cumulative mission duration (no resupply or ISRU, neglect leakage), including a 180 day outbound transit, a 500 day stay on the surface, and a 180 day return flight. State any assumptions necessary to determine these values, but do NOT include mass of packaging or additional infrastructure at this stage.
2. From the above masses, now estimate the stowage volumes required for each category of consumable. State any assumptions necessary to determine these values (e.g., stored gas pressure), but do NOT include additional volume that would be needed for supporting infrastructure at this stage.
3. How does the total consumable stowage mass and volume required for this trip compare to the mass and volume of cargo capacity that the space shuttle can deliver to LEO? (hint: consider the internal volume of an ISS module or Spacelab and total payload bay launch mass)