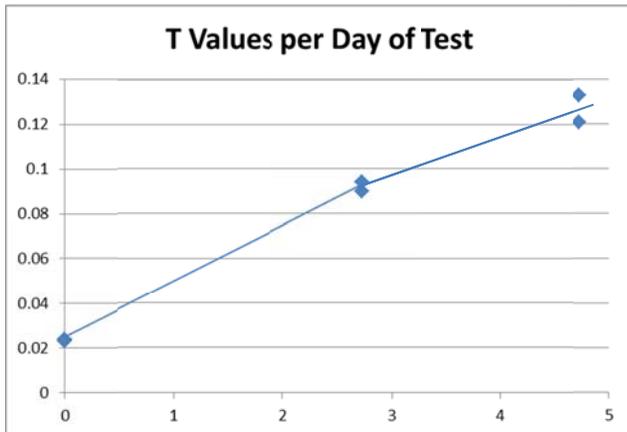




Whole Module Offgas Test Report: Orbital D-1 Module

From March 20 to March 25, 2013 a chemist from the JSC Toxicology Group acquired samples of air in 500 ml evacuated canisters from the sealed Orbital D-1 Module at Wallops Island, VA. One background sample was acquired from the facility near the module at the start of the test. Samples of the module air were taken in triplicate once the module had been sealed, and then taken again in triplicate 2.73 days later, and again 4.73 days from the start. Of the samples collected at each time, the first served as a line purge and was not analyzed, and two of the latter samples were analyzed. The results of 7 samples (one background and 3 pairs) are reported in the appended tables. Table 1 lists the analytical concentrations. Table 2 gives the T values indexed against 7-day Spacecraft Maximum Allowable Concentrations (SMACs) and Table 2A gives T values indexed against 180-day SMACs. For purposes of the offgas test only the 7 day SMACs are relevant. The average recoveries of surrogate standards placed in the canisters to validate analytical integrity were as follows: ^{13}C -acetone, 101%; fluorobenzene, 98%; and chlorobenzene, 94%.

Analytical data contained in Table 2 show that the ambient facility air was extremely clean (0.01 T units). Analyses of pairs of samples that were taken during the test show excellent agreement between



the pairs and a rate of increase of 0.025 T units per day (first interval, $t = 0$ d to $t = 2.73$ d) and 0.018 units per day (second interval, $t = 2.73$ d to $t = 4.73$ d). The slight decline in offgas rate is evident in the chart. The module contained 71% of the mass of materials that will be present at launch.

If the time from last purge of the module on the ground to crew first entry on orbit is 19 d as a worst-case scenario, then the estimated T value at the time of first entry is $0.00 + [(2.7 \times$

$0.025) + (16.3 \times 0.018)]/0.71 = 0.51$ T units. This T value is well below the threshold that would impose constraints on crew operations at the time of first entry. The primary contributors to the T value during the test were trimethylsilanol, acetaldehyde, and hexamethylcyclotrisiloxane. The crew can enter the module with no special protection against volatile pollutants; however, the usual protections against floating particles should still be followed.

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Date