Soyuz 22 Return Samples: Assessment of Air Quality aboard the International Space Station

International Space Station: Three mini-grab sample containers (m-GSCs) were returned aboard Soyuz 22 because of concerns that new air pollutants were present in the air and these were getting into the water recovery system. The Total Organic Carbon Analyzer had been giving increasing readings of total organic carbon (TOC) in the potable water, and it was postulated that an increased load into the system was responsible. The toxicological assessment of 3 m-GSCs from the ISS is shown in Table 1. The recoveries of the 3 standards (as listed above) from the GSCs averaged 103, 95 and 76%, respectively. Recovery from formaldehyde control badges were 90 and 91%.

Table 1. Analytical Summary of ISS Results

Module/ Sample	Date of Sample	NMVOCs[a] (mg/m^3)	Freon 218 (mg/m^3)	T Value[b] (units)	Alcohols (mg/m^3)	Formaldehyde ($\mu g/m^3$)		
Lab	9/15/10	6.5	100	0.55	3.4	Start date	Lab	SM
SM	9/15/10	6.6	82	0.39	4.0	5/31/10	32	30
Columbus	9/15/10	5.7	69	0.35	4.0	7/12/10	31	29
						8/11/10	60	49
Guideline		*<25*	*none*	*<1.0*	*<5*	*<120*		

[a] Non-methane volatile organic hydrocarbons, excluding Freon 218
[b] Based on 180-d SMACs and calculated excluding CO_2, formaldehyde, and siloxanes.

The T-values suggest relatively clean air. There was nothing in the air samples to suggest that the load of organic compounds detected by our methods had increased in conjunction with the rises in water TOC. A test of formaldehyde release was conducted in conjunction with work on melamine foam in the Microgravity Sciences Glovebox (MSG). The results, which are not tabulated, were 48 and 56 $\mu g/m^3$. The first value was from a pair of badges deployed before work began and the later from badges deployed during and after work was completed. The small difference is not significant.

Freon 218 (perfluoropropane) levels continue to be high and fairly uniformly distributed throughout the ISS stack. This compound is far from toxic at these levels.

John T. James, Ph.D.
Chief Toxicologist

Enclosures
Table 1: Analytical concentrations of compounds found in the Soyuz m-GSCs
Table 2: T-values of the compounds in table 1