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RESULTS OF THERMAL ENVIRONMENT MEASUREMENTS
ON THE THERMAL CANNISTER EXPERIMENT AND
GET AWAY SPECIAL ENCLOSURE

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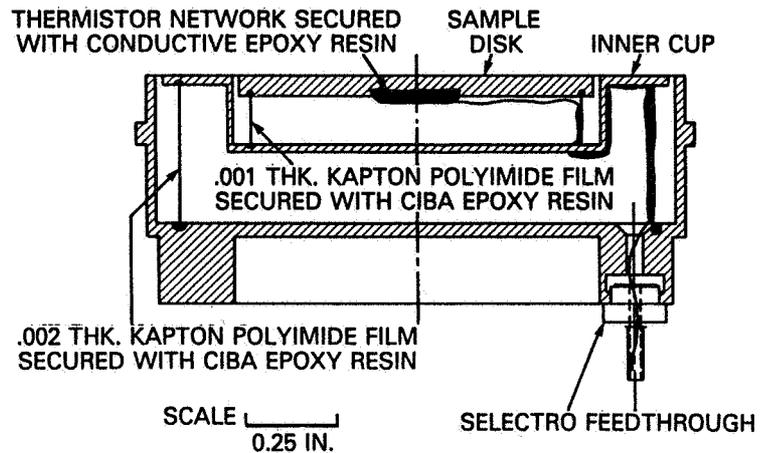
INSTRUMENTATION

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• FLUX SENSORS

- CUPS CONTAINING THERMALLY ISOLATED SURFACES
- PRT SENSORS WHICH MEASURED TEMPERATURE
- SILVER TEFLON COATED (SAME AS CANISTER RADIATORS)
- SIGNAL CONDITIONED THROUGH CANISTER ELECTRONICS
- PREVIOUSLY FLOWN ON OSO, IMP AS COATING EXPERIMENT

SENSOR CUP DESIGN



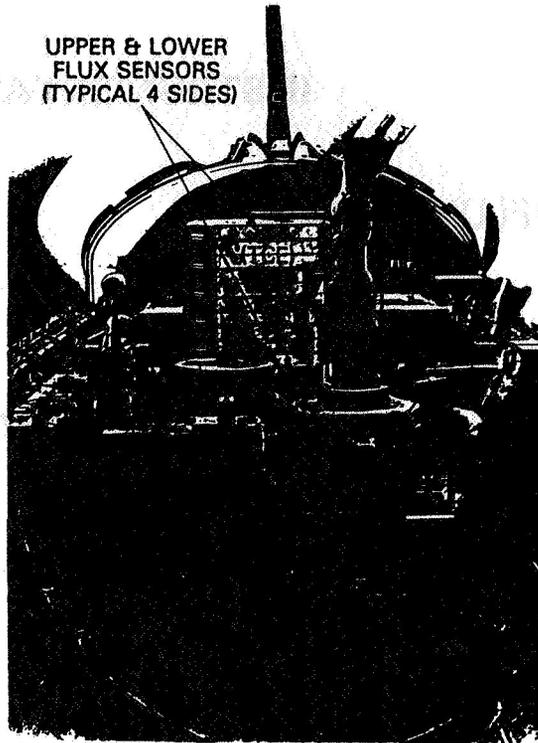
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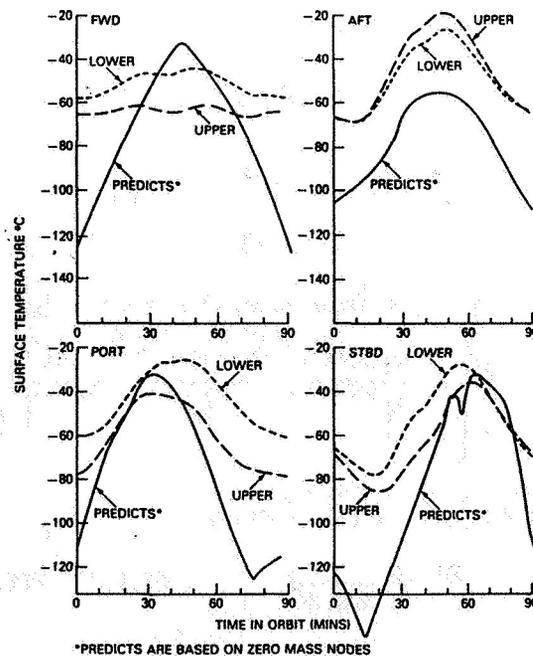
UPPER & LOWER
FLUX SENSORS
(TYPICAL 4 SIDES)

FLUX SENSOR LOCATIONS

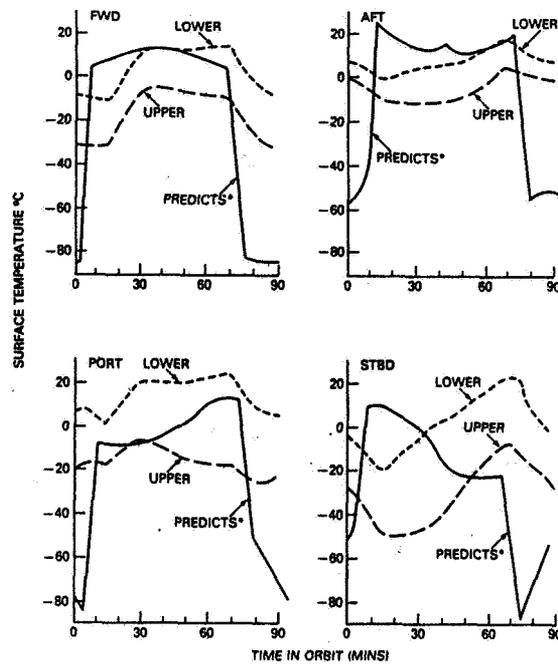
THERMAL CANISTER EXPERIMENT (TCE)



FLUX SENSOR TEMPERATURE HISTORY (-X_{SI} MODE)



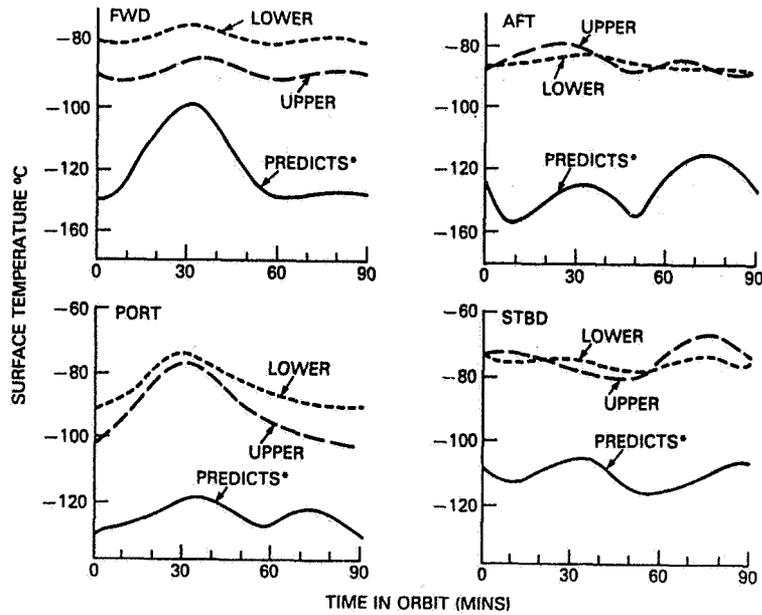
**FLUX SENSOR TEMPERATURE HISTORY
(+Z_{SI} MODE) HOT ORBIT**



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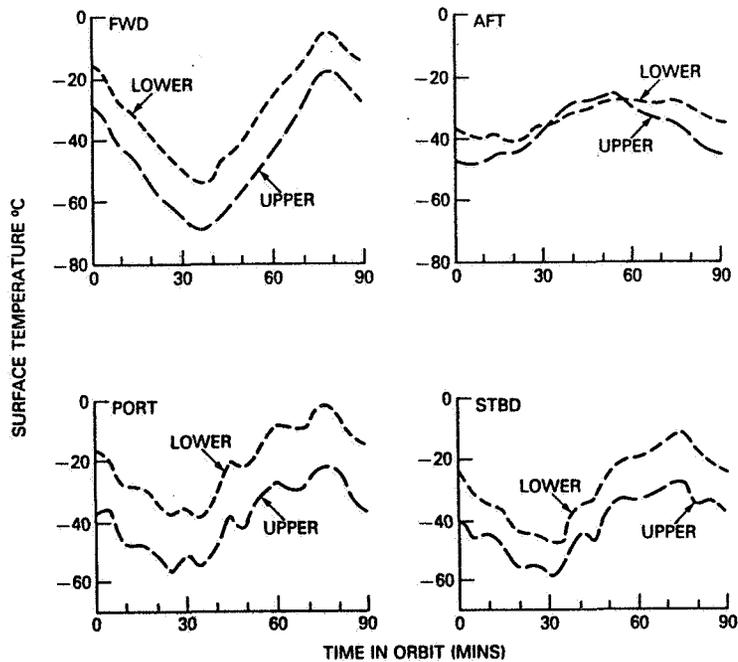
*PREDICTS ARE BASED ON ZERO MASS NODES

FLUX SENSOR HISTORY (-Z_{LV} MODE) COLD ORBIT



*PREDICTS ARE BASED ON ZERO MASS NODES

FLUX SENSOR TEMPERATURE HISTORY (PTC MODE)



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ORBITAL AVERAGE FLUXES

	$-Z_{Lv}$		$+X_{St}$		PTC		$+Z_{St}$	
	MEASURED	PREDICT	MEASURED	PREDICT	MEASURED	PREDICT	MEASURED	PREDICT
	W/ft ²							
FWD _L	5.8	1.9	9.9	6.1	16.8	7.1	24.1	18.4
FWD _U	4.6		7.8		11.7		17.9	
PORT _L	5.4	1.9	11.9	4.3	17.3	8.8	27.7	17.5
PORT _U	4.7		8.8		12.5		17.9	
AFT _L	4.8	1.7	10.7	6.6	13.4	6.6	25.1	22.3
AFT _U	4.9		11.3		12.5		21.4	
STBD _L	6.1	2.8	9.8	6.6	15.7	8.3	24.8	16.1
STBD _U	6.2		9.3		12.5		15.7	

APPROXIMATE MLI TEMPERATURES FOR THE FOLLOWING ORBITAL CASES:

<u>ORBITER ATTITUDE</u>	<u>FLIGHT DATA</u>	<u>PREDICTIONS</u>
● TAIL TO SUN		
PALLET	−80°C (MINIMUM)	−112
UPPER PLATFORM	−60°C (MINIMUM)	−118
LOWER PLATFORM	−48°C (MINIMUM)	−112
● NOSE TO SUN		
PALLET	−15/−48°C (MAX/MIN)	−53/−86
UPPER PLATFORM	−50/−60°C (MAX/MIN)	−57/−91
LOWER	−48°C (MINIMUM)	−85/−56
● BAY TO SUN		
PALLET	100°C/−10°C (MAX/MIN)	107/65
UPPER PLATFORM	+75/+10°C (MAX/MIN)	103/63
LOWER PLATFORM	+80/+30°C (MAX/MIN)	117/75

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THERMAL ENVIRONMENT OSS-1 THERMAL CANISTER EXPERIMENT RESULTS

OBJECTIVE: TO MEASURE TOTAL ABSORBED FLUX ON THERMAL CANISTER RADIATORS IN ORDER TO DETERMINE HEAT REJECTION CAPABILITY

RATIONALE: OSS-1 PALLET CONTAINED A VARIETY OF INSTRUMENTS WITH IRREGULAR SURFACE GEOMETRY AND PROPERTIES WHICH LIMITED PREDICTABILITY

METHOD: MEASURE TEMPERATURE (T_s) OF ISOLATED SURFACES AND CALCULATE FLUX:

$$\frac{Q}{A} = \epsilon \sigma T_s^4$$

WHERE:

Q/A = ABSORBED FLUX (W/FT²)

ϵ = EMMITTANCE

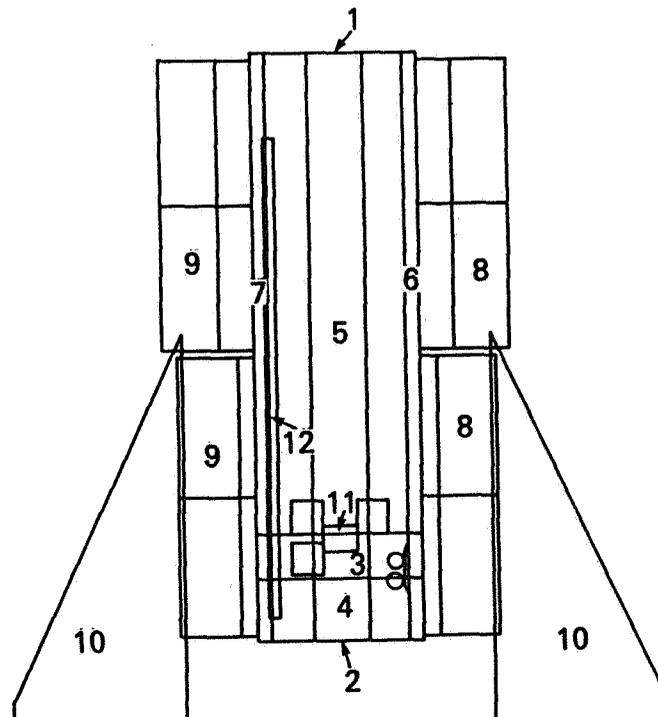
σ = STEPHEN-BOLTZMANN CONSTANT

KAPTON EROSION

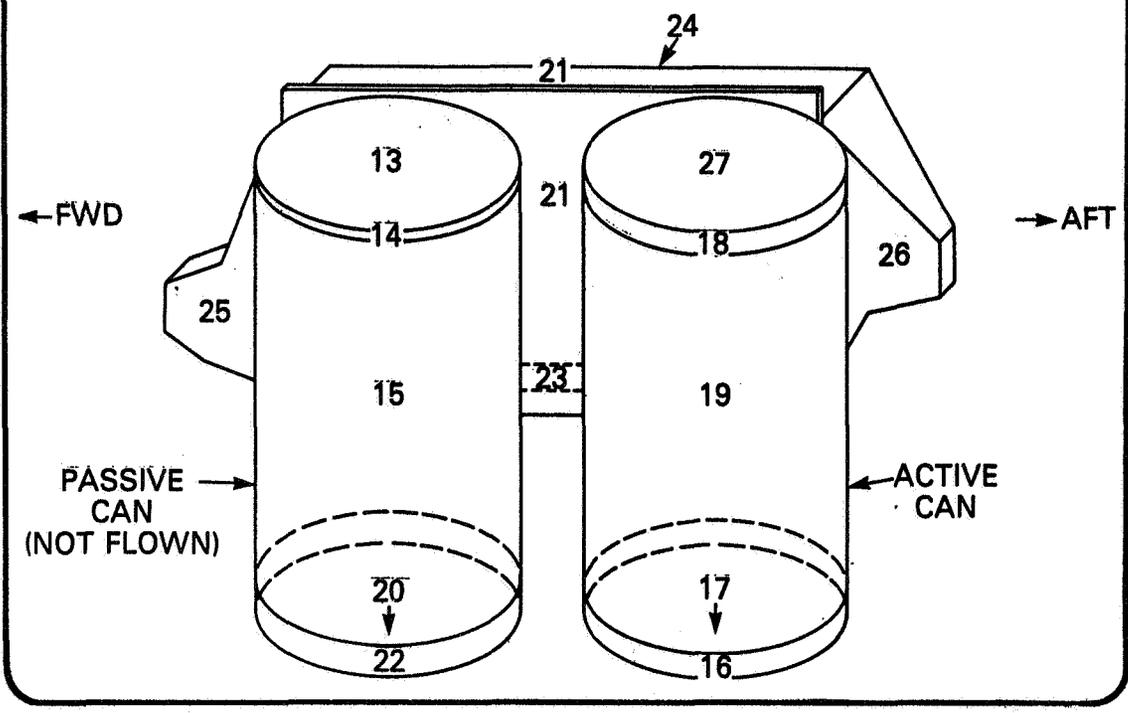
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- KAPTON ON EXTERNAL SURFACES SUFFERED CONSIDERABLE EROSION DURING FLIGHT IN RAM DIRECTION
- SAMPLES REMOVED FROM THE TCE WERE MEASURED FOR WEIGHT LOSS, SOLAR ABSORBANCE, IR EMITTANCE, TENSILE STRENGTH AND PERCENT ELONGATION
- SURFACE TEMPERATURE WAS APPROXIMATELY
- RESULTS SHOWED BETWEEN 16-35% WEIGHT LOSS, A CHANGE IN α/ϵ FROM .62 TO .83, A CHANGE IN TENSILE STRENGTH FROM 22 TO 18K PSI AND PERCENT ELONGATION FROM 38 TO 10%
- CAUSE THOUGHT TO BE FROM INTERACTION OF ATOMIC OXYGEN/UV AND TEMPERATURE
- COVERING KAPTON WITH BETA CLOTH OR COATINGS WILL PROBABLY OFFER ENOUGH PROTECTION FOR FUTURE APPLICATIONS

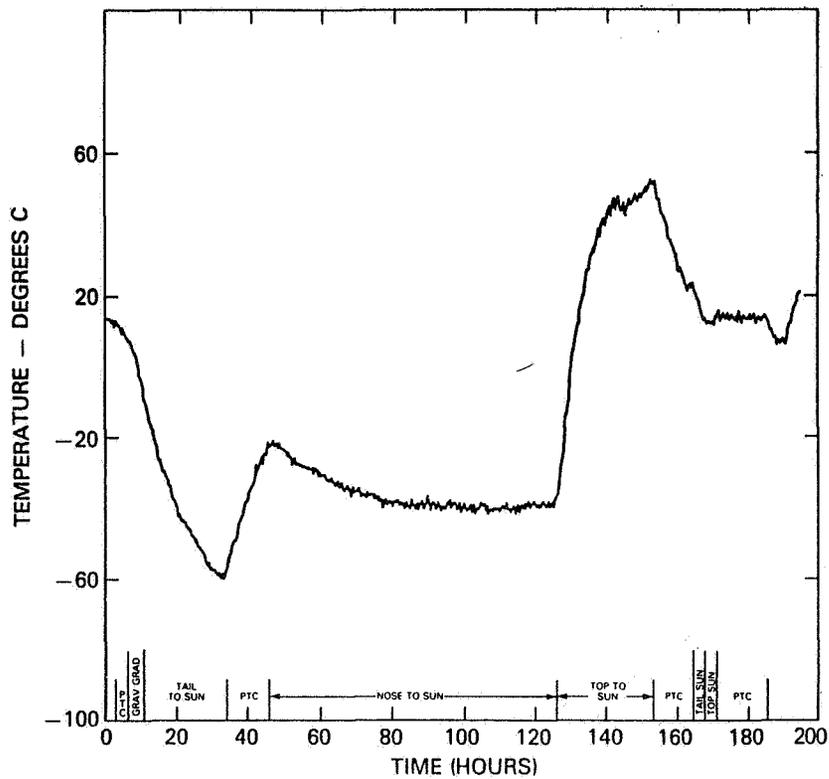
GAS — STS-3



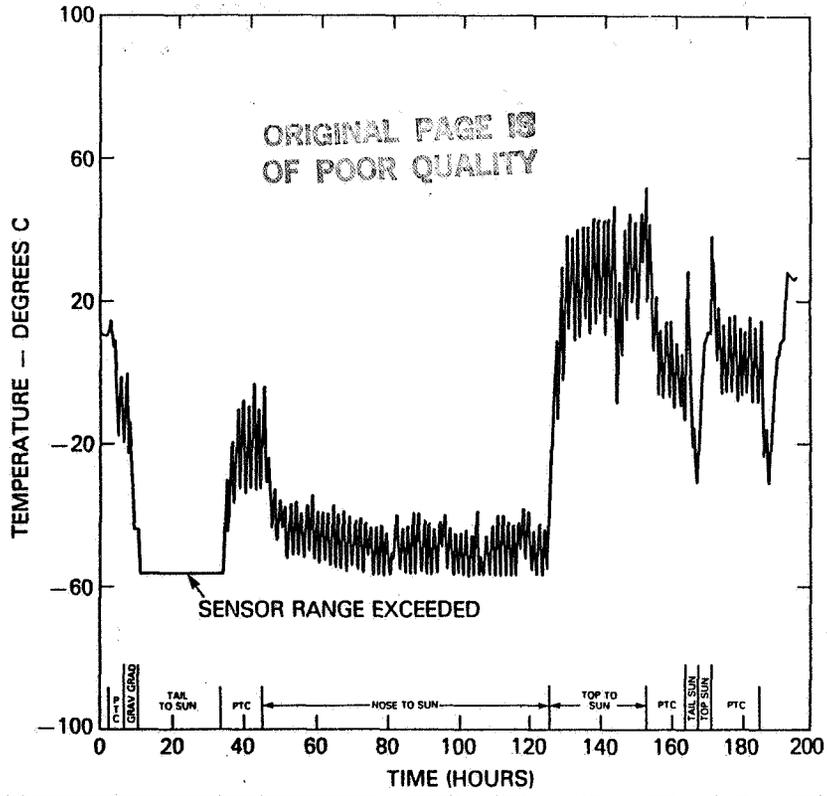
GSFC GAS CANS & ADAPTER BEAM EXTERNAL NODAL BREAKDOWNS STS-3



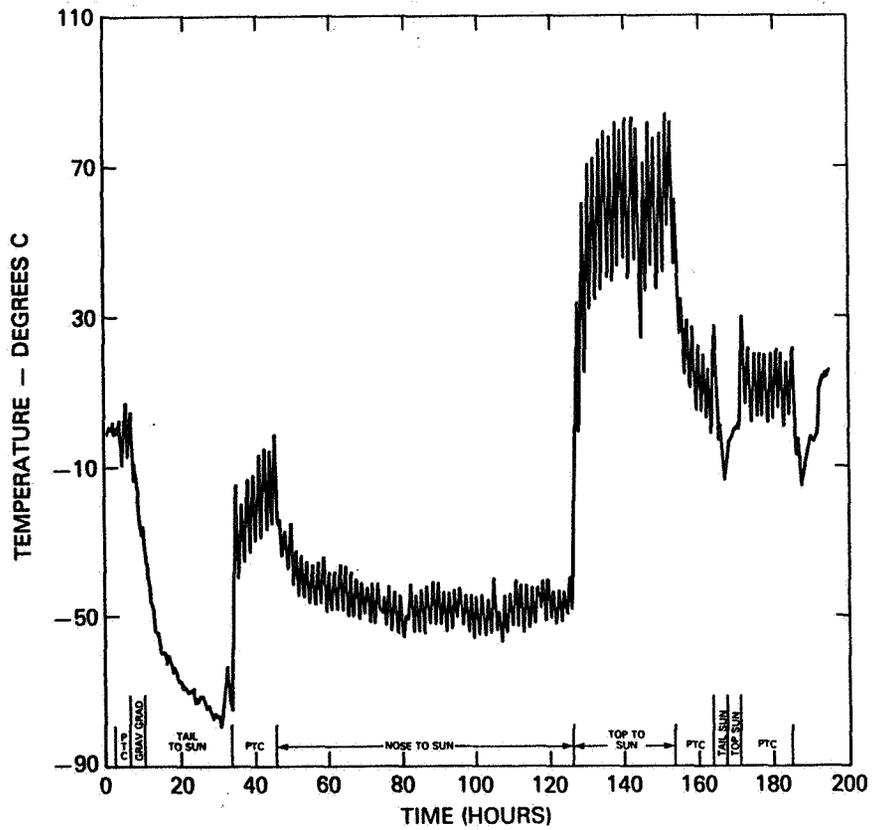
ADAPTER BEAM FACE



CONTAINER EXTERNAL TOP



CONTAINER EXTERNAL BOTTOM

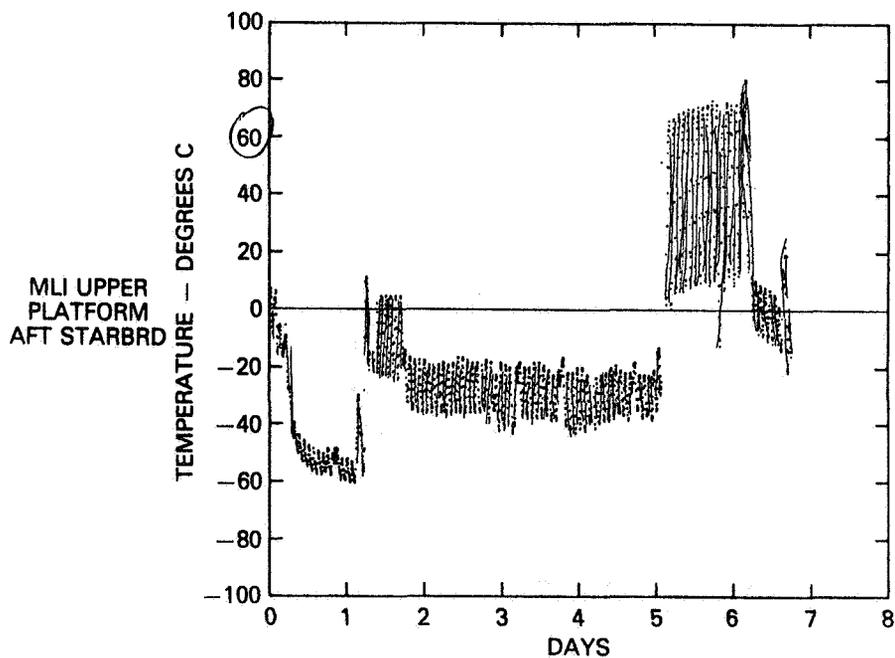


GAS THERMAL RESULTS

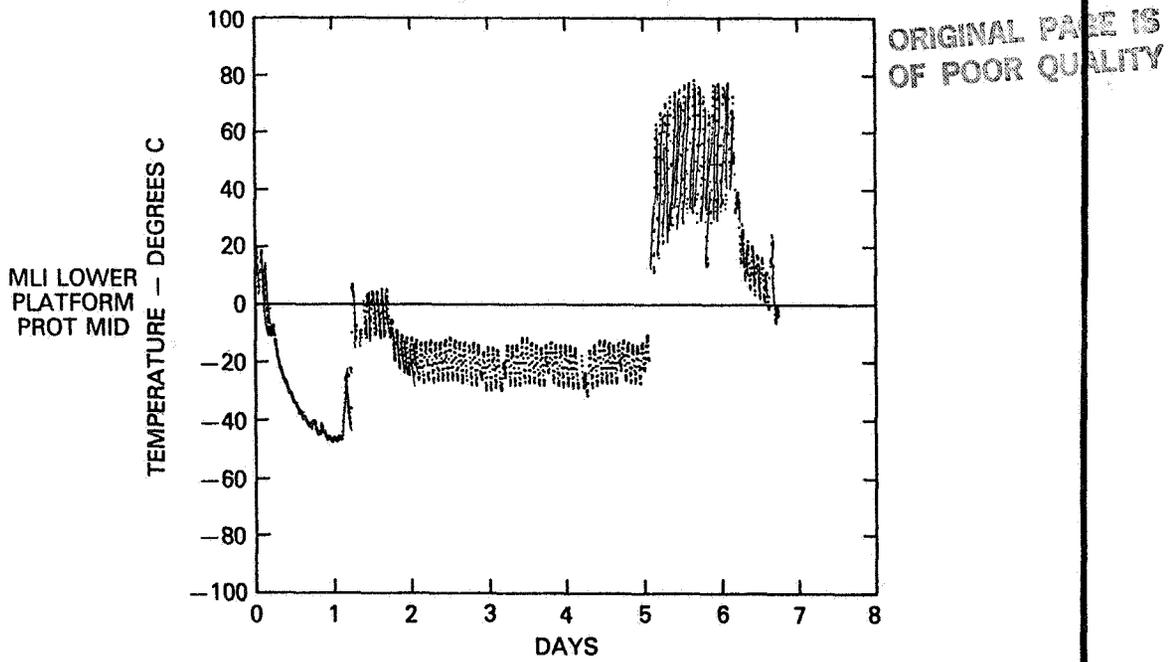
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	<u>PREDICTIONS</u>	<u>FLIGHT</u>
ADAPTER BEAM (HOT-BAY TO SUN)	+ 37°C ± 46°C ($\bar{a} = .32$) ($a = .36$)	+ 45 TO + 50°C
ADAPTER BEAM (COLD-NOSE TO SUN)	- 78°C	- 40°C
BOTTOM COVER (HOT-BAY TO SUN)	+ 63°C	+ 60 TO + 65°C
BOTTOM COVER (COLD-NOSE TO SUN)	- 76°C	- 45 TO - 50°C
TOP COVER (HOT-BAY TO SUN) (BRACKET)	+ 31°C	+ 25 TO + 35°C
TOP COVER (COLD-NOSE TO SUN) (BRACKET)	- 73°C	- 47 TO - 51°C

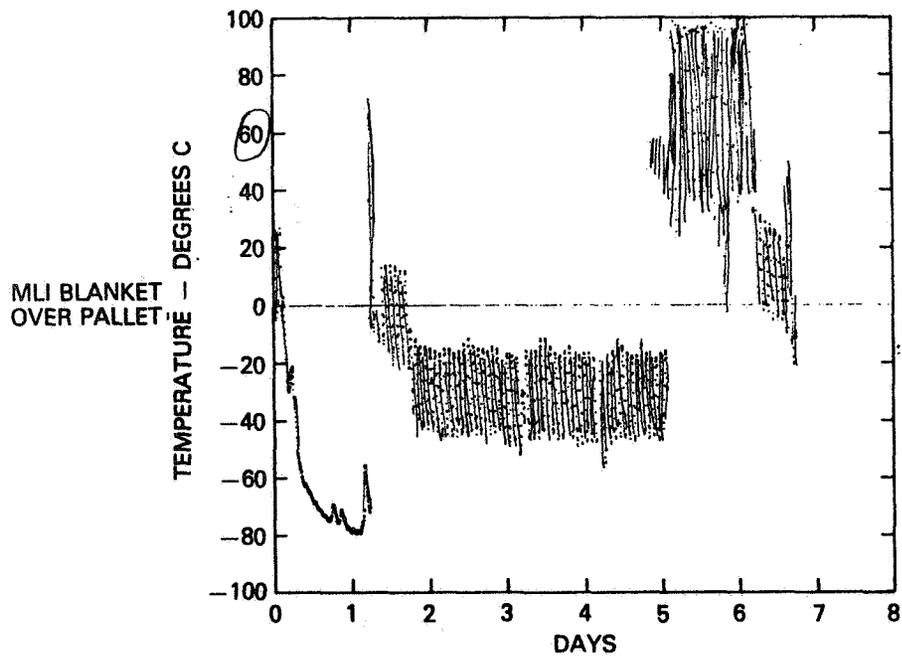
OSS-1 THERMISTOR TEMPERATURES



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SUMMARY

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- FLUX LEVELS MEASURED IN ALL STS ATTITUDES ARE HIGHER THAN PREDICTIONS
- IN COLD ($-Z_{LV}$) AND MODERATE ($\mp X_S$) ATTITUDES FLIGHT RESULTS ARE A FACTOR OF 2 TO 3 HIGHER THAN PREDICTS
- IN HOT ATTITUDE MUCH BETTER AGREEMENT OCCURRED

CONCLUSIONS

- IN COLD OR MODERATE ATTITUDES OTHER SOURCES MAY BE CONTRIBUTING TO ADDED INPUTS I.E. ALBEDO, EARTH SHINE, SHUTTLE BACKGROUND, ETC.
- IN HOT ATTITUDE SMALLER DIFFERENCES COULD BE ATTRIBUTED TO COATINGS ASSUMPTIONS OR CALCULATION UNCERTAINTY

THERMAL CANISTER EXPERIMENT (TCE) RE-ENTRY DATA

