TEST FOR CONTAMINATION OF MgF_2 - COATED MIRRORS

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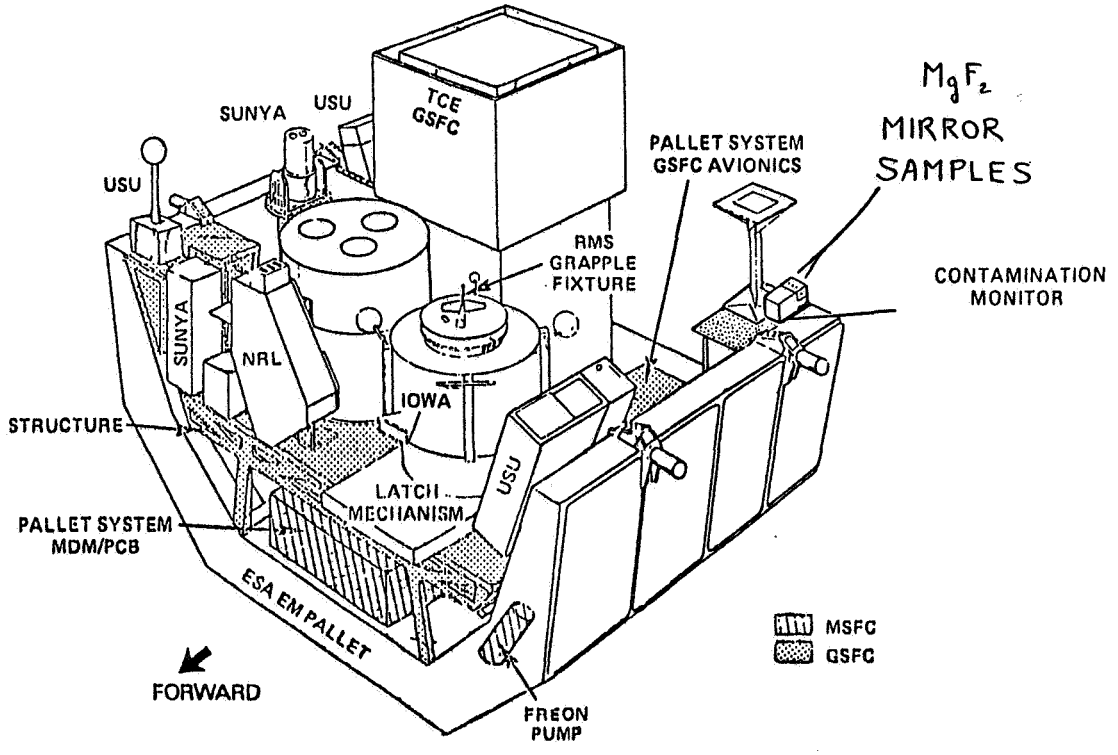
B. FLINT, ACTON RESEARCH

PRE-FLIGHT REFLECTIVITIES MEASURED: AUGUST 1981

STS-3 FLIGHT: 22 MARCH-30 MARCH 1982

POST-FLIGHT REFLECTIVITIES MEASURED: JULY-SEPTEMBER 1982

OSS-1 PALLET PAYLOAD



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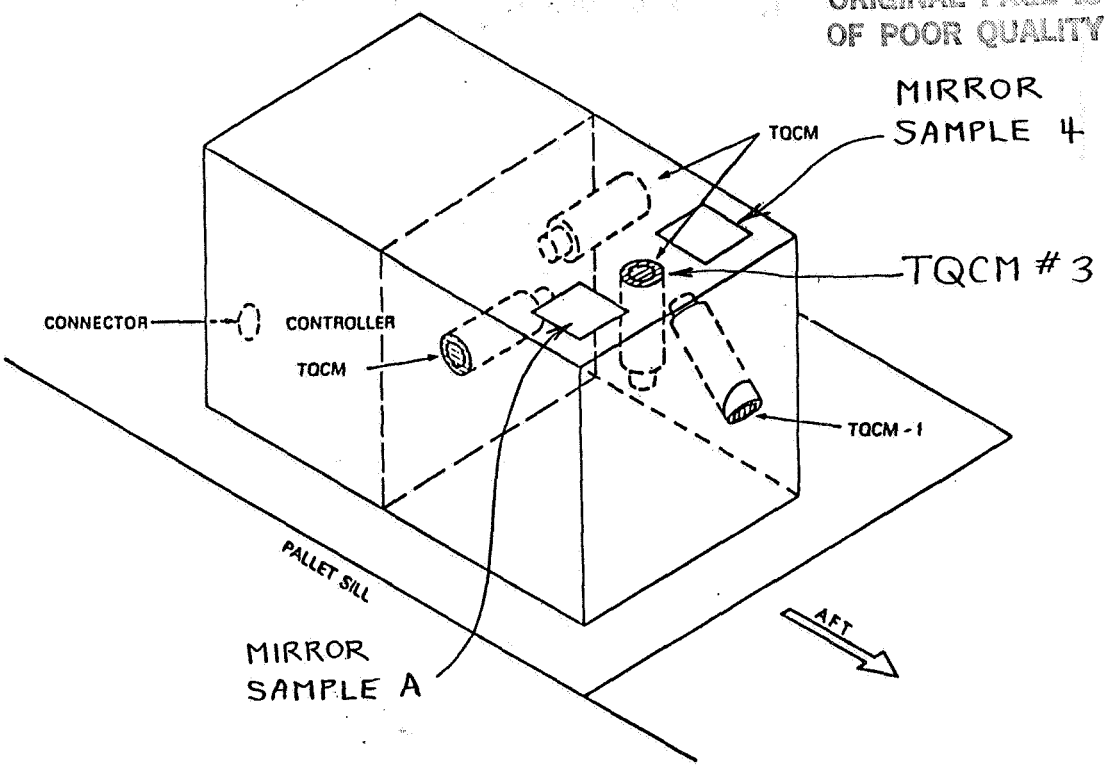
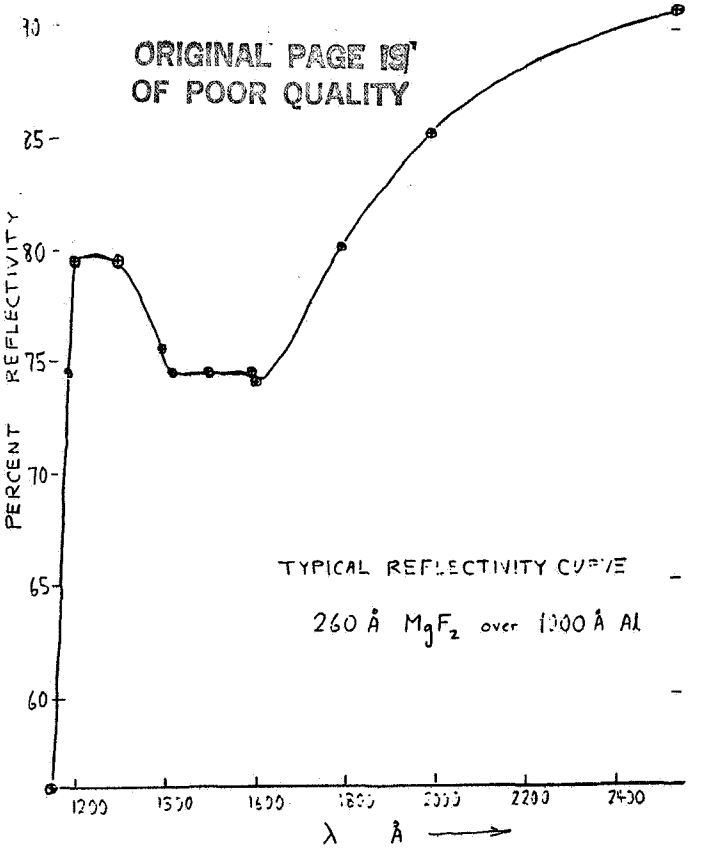
OSS-1 CONTAMINATION MONITOR

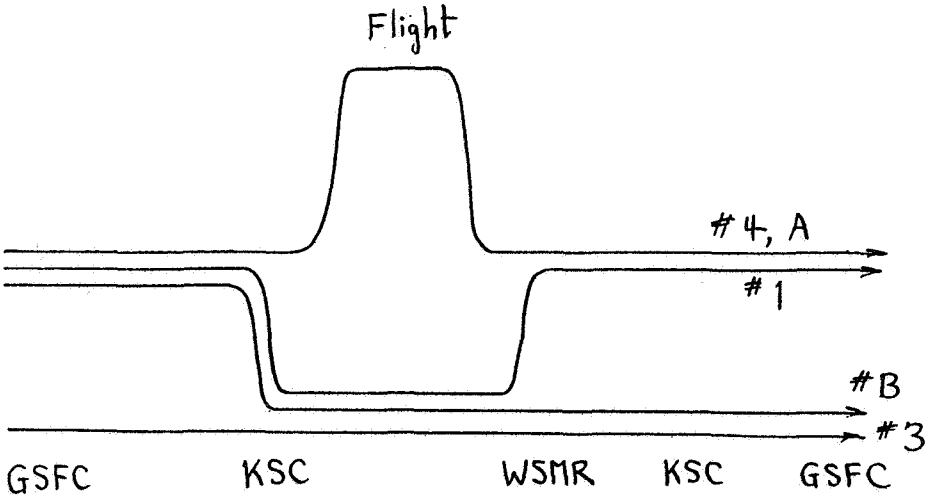


OPTICAL COATING PROCEDURE

ACTON RESEARCH	PERKIN-ELMER
OIL-PUMPED VACUUM	OIL-FREE VACUUM
~1 X 10^{-6} TORR	~3 X 10^{-7} TORR
260-270 Å MgF_2	250±25 Å MgF_2
~1000 Å ALUMINUM	~650 Å ALUMINUM
MgF_2 DEPOSITION @ ~25 Å/SEC	MgF_2 DEPOSITION @ ~ 8 Å/SEC
BOTH COATINGS ON IN ~18 SEC	BOTH COATINGS ON IN ~115 SEC



FLOW OF FLIGHT SAMPLES & CONTROL MIRRORS



FLIGHT MIRRORS

REFLECTIVITIES IN PERCENT

SAMPLE	BEFORE FLIGHT				AFTER FLIGHT			
	1150 Å	1216 Å	1600 Å	2200 Å	1150 Å	1216 Å	1600 Å	2200 Å
A EXPOSED	<70.	81.7	77.	86.1	66.5	80.	76.5	85.3
A COVERED	<70.	81.7	77.	86.1	59.4	77.2	72.2	87.2
4 EXPOSED	55.8	72.9	74.	86.6	57.4	67.9	73.9	83.2
4 COVERED	55.8	72.9	74.	86.6	57.2	67.8	71.2	84.1

ALL VALUES ARE ±2%.

"EXPOSED" = EXPOSED TO SUN IN FLIGHT.

ALL VALUES ARE CORRECTED MEANS OF MEASUREMENTS AT P-E AND ACTON.

CONTROL MIRRORS

REFLECTIVITIES IN PERCENT

SAMPLE	BEFORE FLIGHT				AFTER FLIGHT			
	1150 Å	1216 Å	1600 Å	2200 Å	1150 Å	1216 Å	1600 Å	2200 Å
1	55.8	72.9	74.	86.6	57.7	69.6	70.1	85.6
B	<70.	80.2	75.	87.2	-	81.2	74.5	87.2
3 EXPOSED	55.8	72.9	74.	86.6	57.3	68.8	68.9	85.8
3 COVERED	55.8	72.9	74.	86.6	56.1	67.6 (FINGERPRINT)	68.4	82.4

ALL VALUES ARE ±2%.

"EXPOSED" - NOT COVERED BY ALUMINUM SHADE.

ALL VALUES ARE CORRECTED MEANS OF MEASUREMENTS AT P-E AND ACTON.

OBSERVATIONS

1. NO CHANGES >1.8σ OBSERVED, EXCEPT FOR FINGERPRINT.
2. WEAK EVIDENCE (≤1.8σ) FOR DEGRADATION AT 1216 Å AND 1600 Å FOUND IN SEVERAL SAMPLES.
3. NO SIGNIFICANT DIFFERENCE BETWEEN FLIGHT MIRRORS AND CONTROL MIRRORS.
4. COVERED SAMPLES SUFFERED MORE THAN SAMPLES EXPOSED TO SUN, BUT DIFFERENCES BARELY SIGNIFICANT.
5. EXPOSED SIDE OF FLIGHT MIRRORS FOUND TO BE SOMEWHAT DUSTY.

CONCLUSIONS

1. NO EVIDENCE FOR PERMANENT SOLAR-INDUCED DETERIORATION.
2. NO EVIDENCE FOR PERMANENT SHUTTLE-INDUCED DETERIORATION.
3. NO EVIDENCE ON OIL-PUMPED VACUUM VERSUS OIL-FREE VACUUM DURING COATING.