TEST FOR CONTAMINATION OF MgF$_2$ - COATED MIRRORS

A. Bunner, Perkin-Elmer Corporation
J. D. Bartoe, NRL
J. Triolo, Goddard Space Flight Center
TEST FOR CONTAMINATION OF MgF₂ - COATED MIRRORS

J. D. BARTOE, NRL
J. TRIOLIO, GSFC
A. N. BUNNER, PERKIN-ELMER
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

MIRROR
SAMPLE A

MIRROR
SAMPLE 4

TQCM # 3

TQCM - 1

CONNECTOR

CONTROLLER

AFT

PALLETS SILL

OPTICAL COATING PROCEDURE

<table>
<thead>
<tr>
<th>ACTION RESEARCH</th>
<th>PERKIN-ELMER</th>
</tr>
</thead>
<tbody>
<tr>
<td>OIL-PUMPED VACUUM</td>
<td>OIL-FREE VACUUM</td>
</tr>
<tr>
<td>(-1 \times 10^{-6}) TORR</td>
<td>(-3 \times 10^{-7}) TORR</td>
</tr>
<tr>
<td>260-270 Å MoF(_2)</td>
<td>250±25 Å MoF(_2)</td>
</tr>
<tr>
<td>(-1000) Å ALUMINUM</td>
<td>(-650) Å ALUMINUM</td>
</tr>
<tr>
<td>MoF(_2) DEPOSITION a (-25) Å/SEC</td>
<td>MoF(_2) DEPOSITION a (-8) Å/SEC</td>
</tr>
<tr>
<td>BOTH COATINGS ON IN (-18) SEC</td>
<td>BOTH COATINGS ON IN (-115) SEC</td>
</tr>
</tbody>
</table>
ORIGINAL PAGE IS OF POOR QUALITY

TYPICAL REFLECTIVITY CURVE

260 Å MgF₂ over 1300 Å Al

FLOW OF FLIGHT SAMPLES & CONTROL MIRRORS

Flight

#4, A

#1

#B

#3

GSFC KSC WSMR KSC GSFC

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### FLIGHT MIRRORS

**REFLECTIVITIES IN PERCENT**

<table>
<thead>
<tr>
<th>SAMPLE</th>
<th>BEFORE FLIGHT</th>
<th>AFTER FLIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1150 Å</td>
<td>1216 Å</td>
</tr>
<tr>
<td>A EXPOSED</td>
<td>&lt;70.</td>
<td>81.7</td>
</tr>
<tr>
<td>A COVERED</td>
<td>&lt;70.</td>
<td>81.7</td>
</tr>
<tr>
<td>4 EXPOSED</td>
<td>55.8</td>
<td>72.9</td>
</tr>
<tr>
<td>4 COVERED</td>
<td>55.8</td>
<td>72.9</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>SAMPLE</th>
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<th>AFTER FLIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1150 Å</td>
<td>1216 Å</td>
</tr>
<tr>
<td>1</td>
<td>55.8</td>
<td>72.9</td>
</tr>
<tr>
<td>B</td>
<td>&lt;70.</td>
<td>80.2</td>
</tr>
<tr>
<td>3 EXPOSED</td>
<td>55.8</td>
<td>72.9</td>
</tr>
<tr>
<td>3 COVERED</td>
<td>55.8</td>
<td>72.9</td>
</tr>
</tbody>
</table>

**ALL VALUES ARE ±2%**.

"EXPOSED" - NOT COVERED BY ALUMINUM SHADE.

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

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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.