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NEUTRAL GAS MASS SPECTROMETER ON THE IECM

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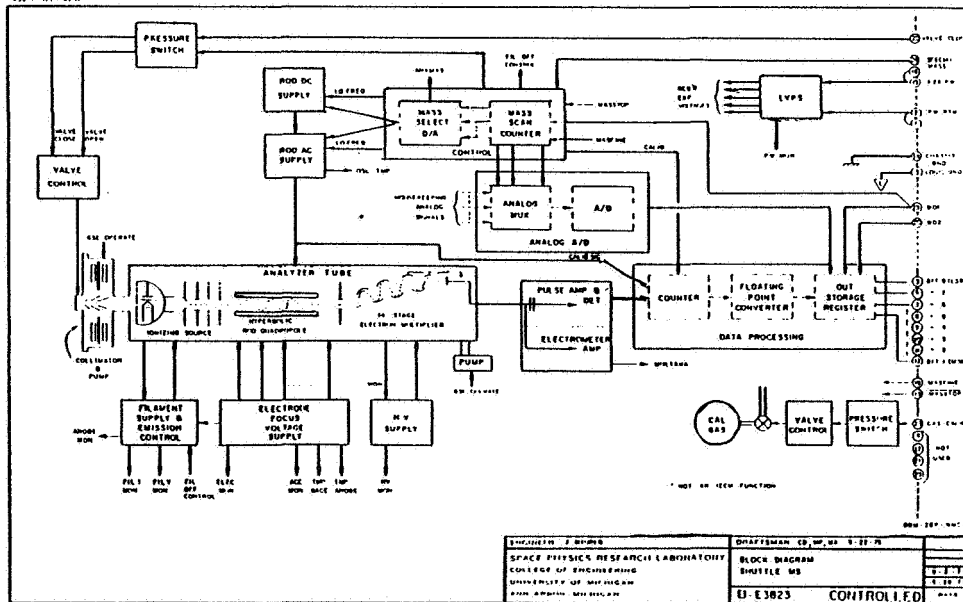
IMAGE A-139 INTENTIONALLY BLANK

NEUTRAL GAS MASS SPECTROMETER
ON THE IECM

G. R. CARIGNAN

1. INSTRUMENT DESCRIPTION
2. GEOMETRY OF THE MEASUREMENT
3. CAPABILITIES AND LIMITATIONS
4. RESULTS
 - A. WATER
 - B. METHANE
 - C. ATMOSPHERIC GASES
 - D. HEAVY MOLECULES
 - E. THRUSTER FIRINGS
 - F. DOOR CLOSINGS
 - G. GAS CALIBRATION
5. CONCLUSIONS
6. FUTURE ACTIVITIES

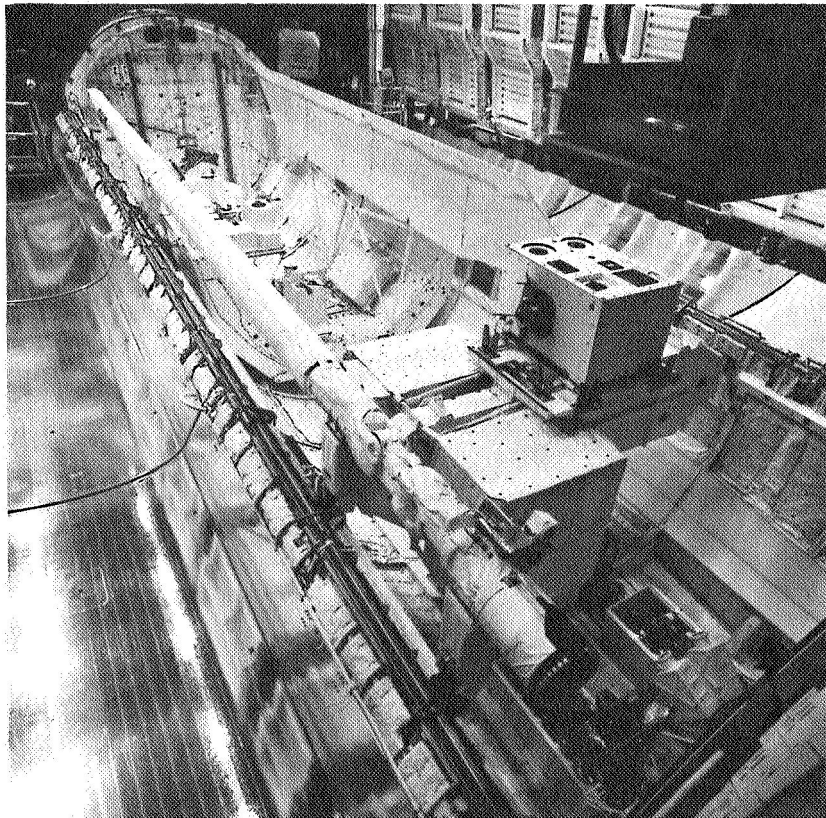
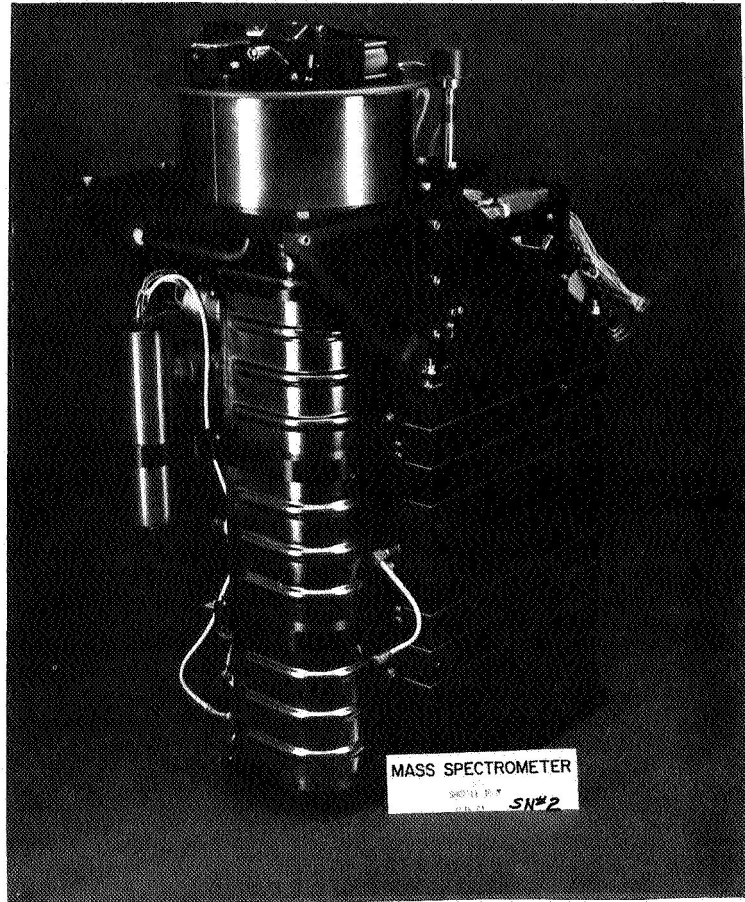
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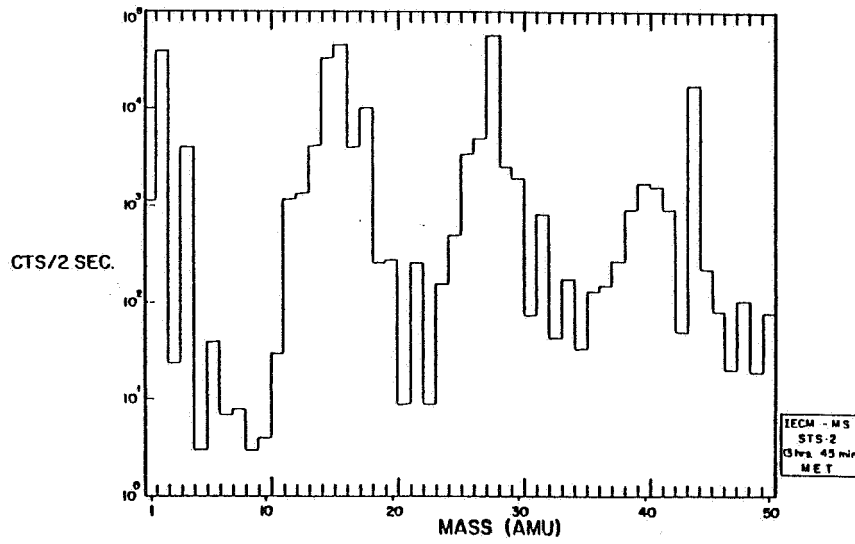
FUNCTIONAL DIAGRAM OF THE MASS SPECTROMETER

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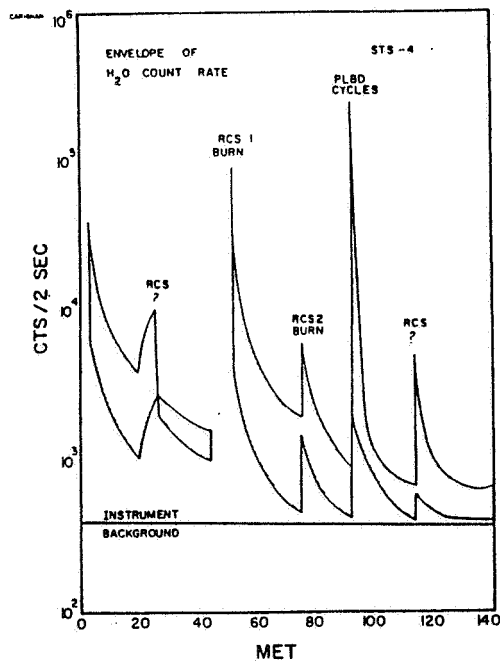
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IECM WITH MASS SPECTROMETER IS THE LARGE
TOP MOUNTED BOX IN THE RIGHT-CENTER OF
THE PHOTO.



SPECTRUM TAKEN BY THE MASS SPECTROMETER ON STS-2 AT 13 HRS. 45 MIN. MET.



ENVELOPE OF H₂O COUNT RATE OVER THE DURATION OF THE FLIGHT OF STS-4. THE VALUES WITHIN THE ENVELOPE ARE STRONGLY MODULATED BY THE INSTRUMENT ANGLE OF ATTACK.

H₂O ON STS-4

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MAXIMUM SOURCE DENSITY
INTERPRETED AS A

$$2.5 \times 10^8 \text{ CC}^{-1}$$

FLUX

$$2.1 \times 10^{14} \text{ CM}^{-2} \text{ SR}^{-1} \text{ S}^{-1}$$

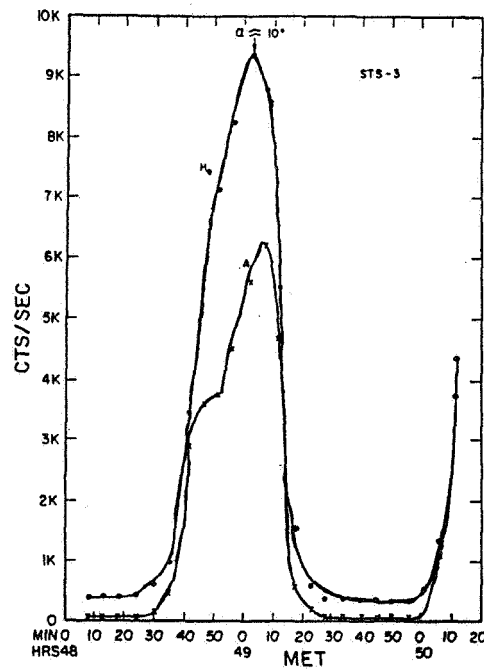
FOR A NOMINAL SCATTERING CROSS SECTION

COLUMN DENSITY

$$3.2 \times 10^{13} \text{ CM}^{-2}$$

TIME CONSTANT FOR DECREASE TO 1/E

≈ 10 HOURS

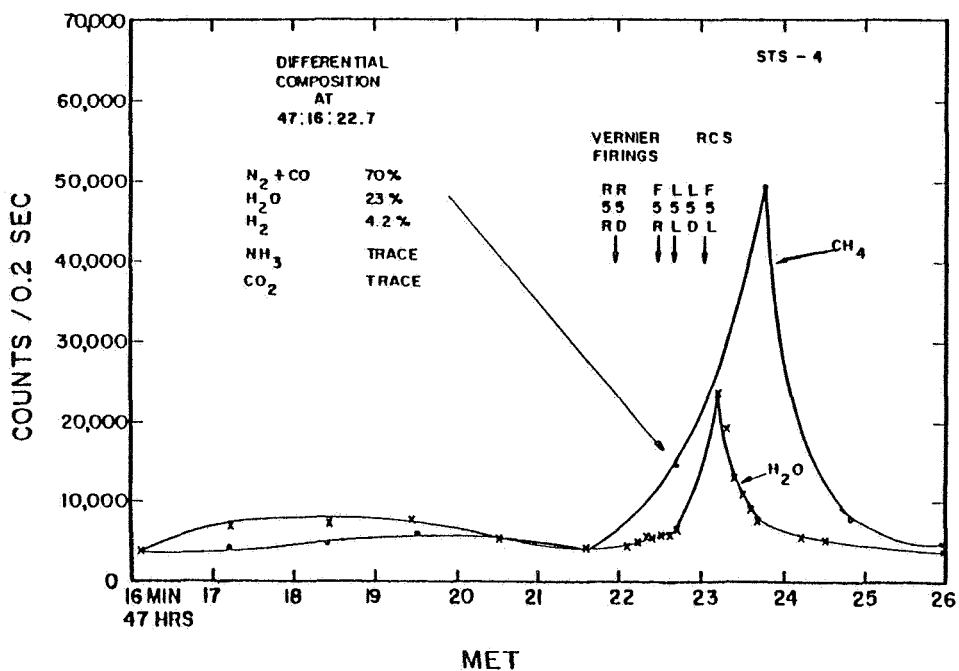


VARIATION IN MEASURED HELIUM AND ARGON AS INSTRUMENT ANGLE OF ATTACK VARIES FROM 170° TO 10°. THE ATMOSPHERIC DENSITIES OBTAINED FROM MANY SUCH OBSERVATIONS ON STS-2, STS-3 AND STS-4 AGREE WELL WITH MODEL VALUES.

AMBIENT DENSITIES

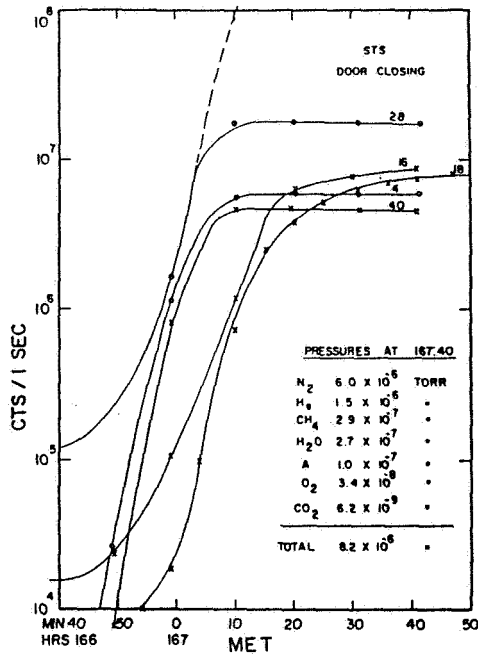
STS - 3 AT 49 HRS MET.

	MEASURED	MODEL (260)
ARGON	$1.2 \times 10^5 \text{ CC}^{-1}$	$1.7 \times 10^5 \text{ CC}^{-1}$
HELIUM	$3.0 \times 10^6 \text{ CC}^{-1}$	$5.4 \times 10^6 \text{ CC}^{-1}$

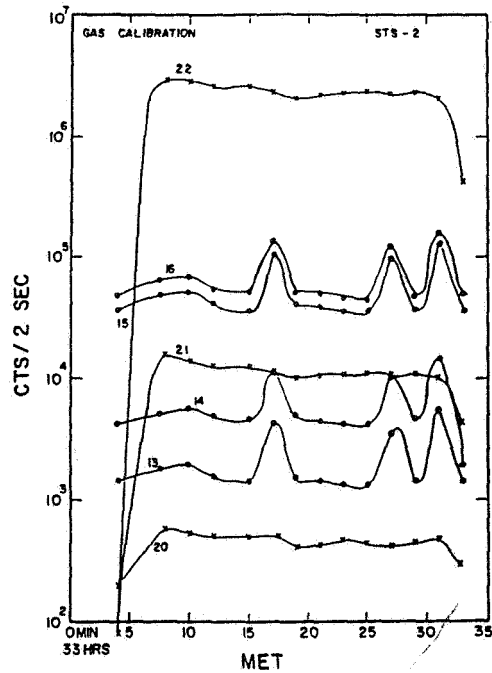


TYPICAL SIGNATURE OF A VERNIER RCS FIRING. METHANE IS BELIEVED TO BE ARTIFICIALLY PRODUCED ON THE ZIRCONIUM OXIDE GETTERS OF THE COLLIMATOR. NITROGEN, WATER AND HYDROGEN ARE THE PRINCIPAL PRODUCTS OBSERVED.

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PRESSURE RISE AND THE COMPOSITION IN THE
PAYLOAD BAY DURING THE DOOR CLOSING EXERCISE
AT 167 HOURS MET ON STS-3.



THE CALIBRATION GAS RELEASE AT 33 HOURS MET ON STS-2. THE MASS
22 ISOTOPE OF NEON DOMINATES THE SPECTRUM. THE ISOTOPICALLY LABELED
WATER AT MASS 20 WHICH WAS RELEASED SIMULTANEOUSLY IS NOT SEEN. THE
MASS 20 AND 21 COUNT RATES ARE CONSISTENT WITH THE PURITY OF THE
NEON-22 GAS LOAD.