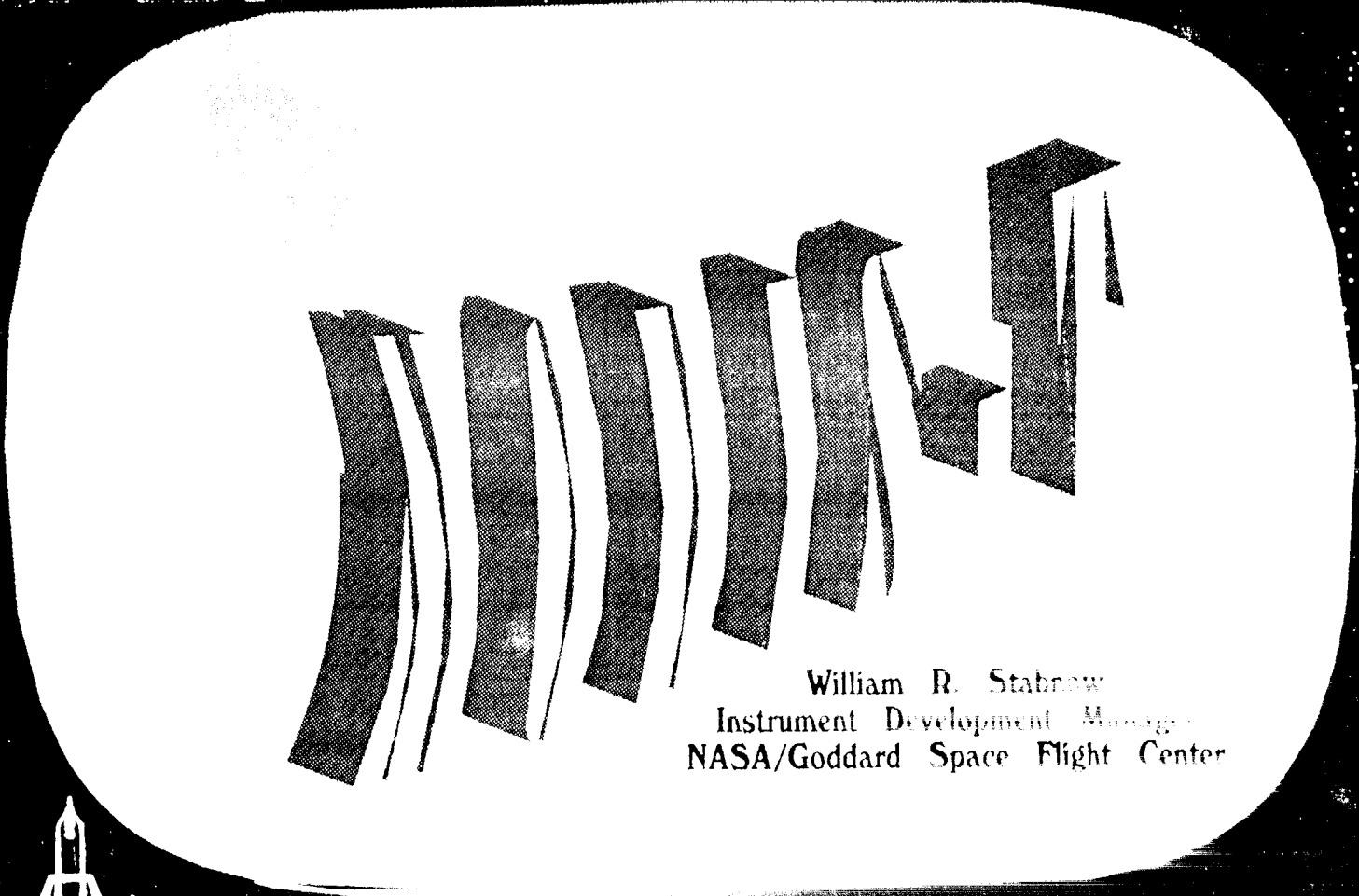


NASA


MOD S Science Team Meeting, Oct. 1 - 3, 1991. Attachmen



William R. Stabrow  
Instrument Development Manager  
NASA/Goddard Space Flight Center



9/29/91  
WRS - 1



MODERATE RESOLUTION IMAGING  
TILT  
SPECTROMETER

Instrument Science Missions

Current Instrument Status

Programmatics



9/29/91

WRS - 2

MODERATE RESOLUTION IMAGING SPECTROMETER  
TILT



Instrument Science Missions

Current Instrument Status

Programmatics



9/29/91

WRS - 3

Instrument Science Missions

Oceans  
Ice  
Atmospheres



9/29/91

WRS - 4

**MISSION TO PLANET EARTH**

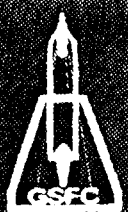
**Primary productivity of oceans, lakes  
Surface water chlorophyll concentration  
Dissolved organic matter  
Sediment transport  
Phytoplankton biomass  
Oceanic photosynthetic potential  
Ocean flow dynamics data support**

**OCEANS**

**LAND**  
**Standing water  
Wetland extent  
Vegetation properties  
Bidirectional reflectance  
Hemispherical albedo**

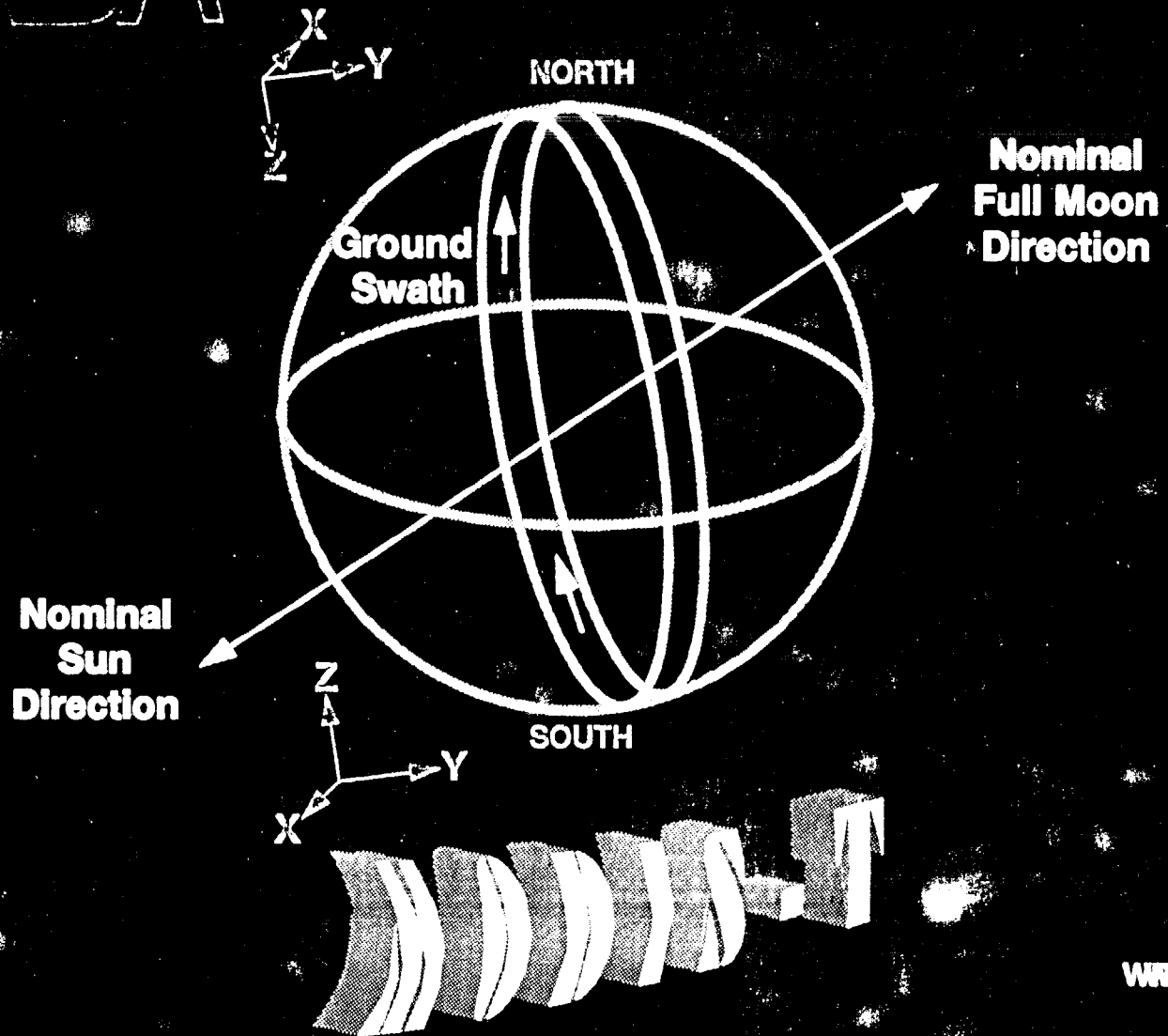


**ATMOSPHERES**



NASA

# EOS A-1 ASCENDING ORBIT

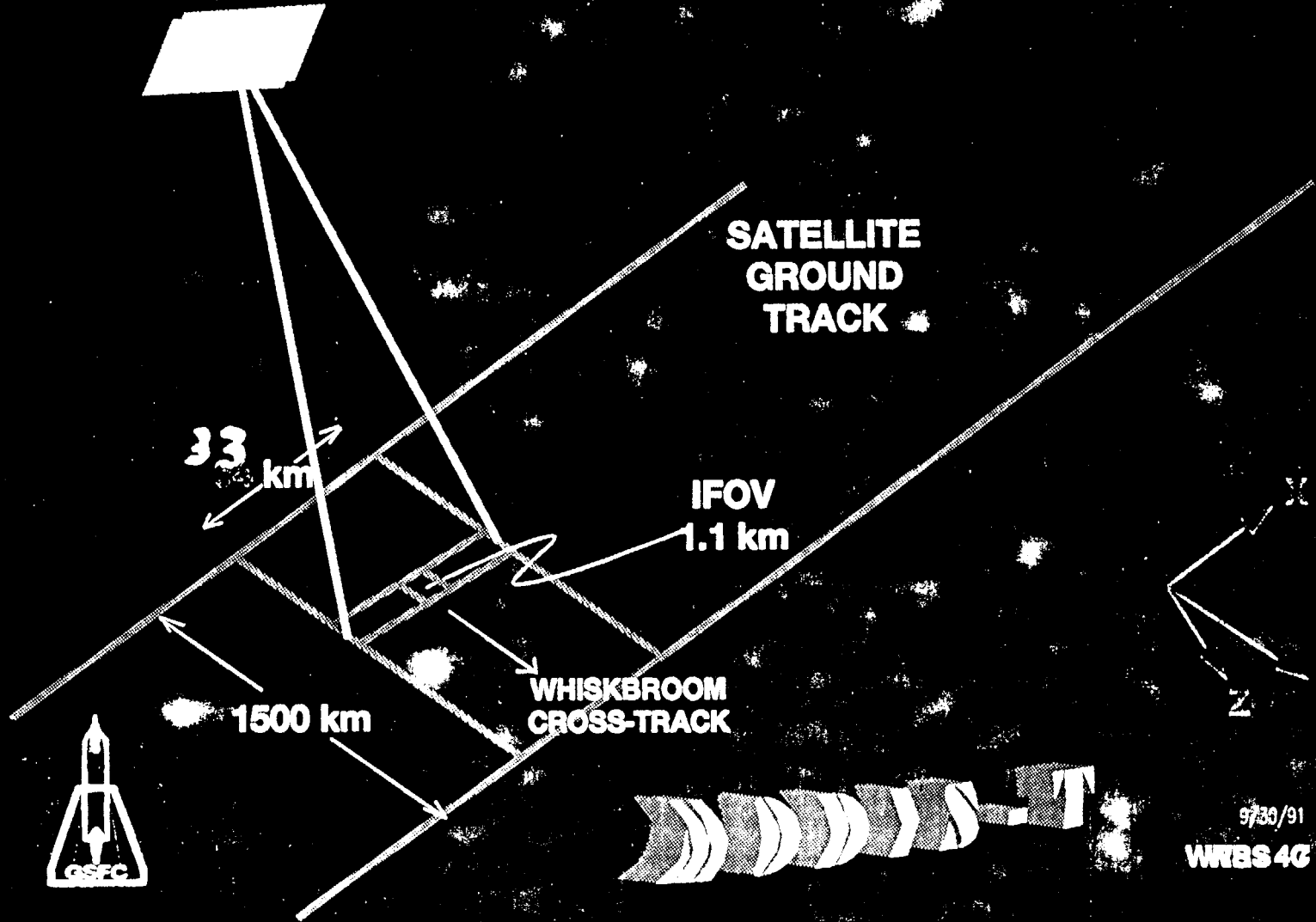


9/30/91

WRBS 4B

NASA

# SCAN GROUND SWATH

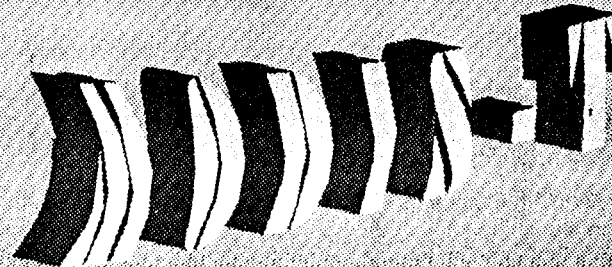


9730/91  
WRBS 4C



## Science Requirements

IFOV	1.56 milliradians (1.1 km at nadir)
Swath	1500 km (90 degree FOV)
Dynamic Range	~170,000:1
Radiometric Accuracy	5% absolute 2% relative to sun
Quantization	12 bits
Polarization sensitivity	< 2.3% for tilts less than 20 degrees
Modulation Transfer Function	0.3 at Nyquist frequency
S/N Performance at 70 degree solar zenith	838:1 @ 440 nm 699:1 @ 620 nm 398:1 @ 845 nm

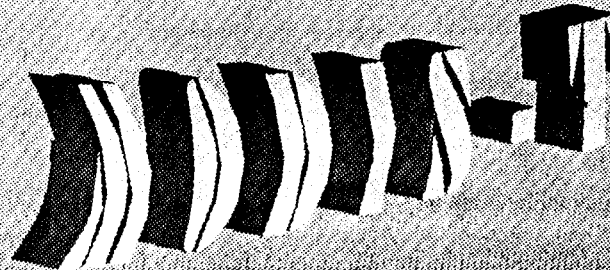
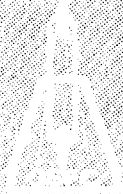






## Derived Requirements

<b>Scan Efficiency</b>	<b>25%</b>
<b>Integration Time</b>	<b>1.127 msec</b>
<b>Collecting Aperture</b>	<b>34 mm</b>
<b>Optical Transmission</b>	<b>0.40 - 0.78 (band# dependent)</b>





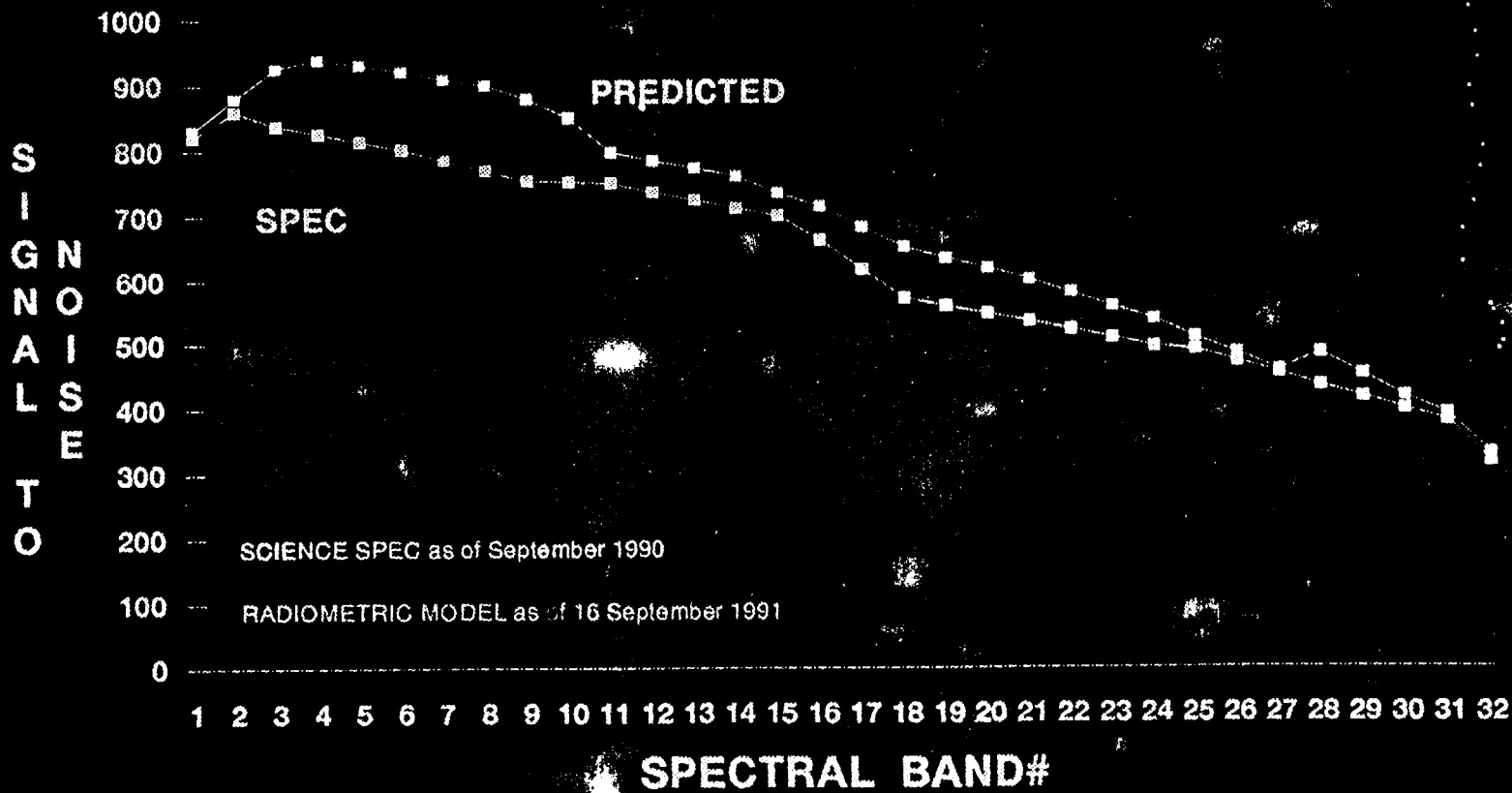
## Accomodation Issues

Size (approximate)	150 x 150 x 60 cm [LxWxH stowed] 150 x 150 x 90 cm [LxWxH diffuser deployed]
Mass	170 kg *
Power	130 Avg Watts (155 Peak Watts)
Data Rate	3.3 Mbps (day) 0.12 Mbps (night) *
Duty Cycle	100% (day)
Platform Altitude	705 km
* Refer to later detail charts	

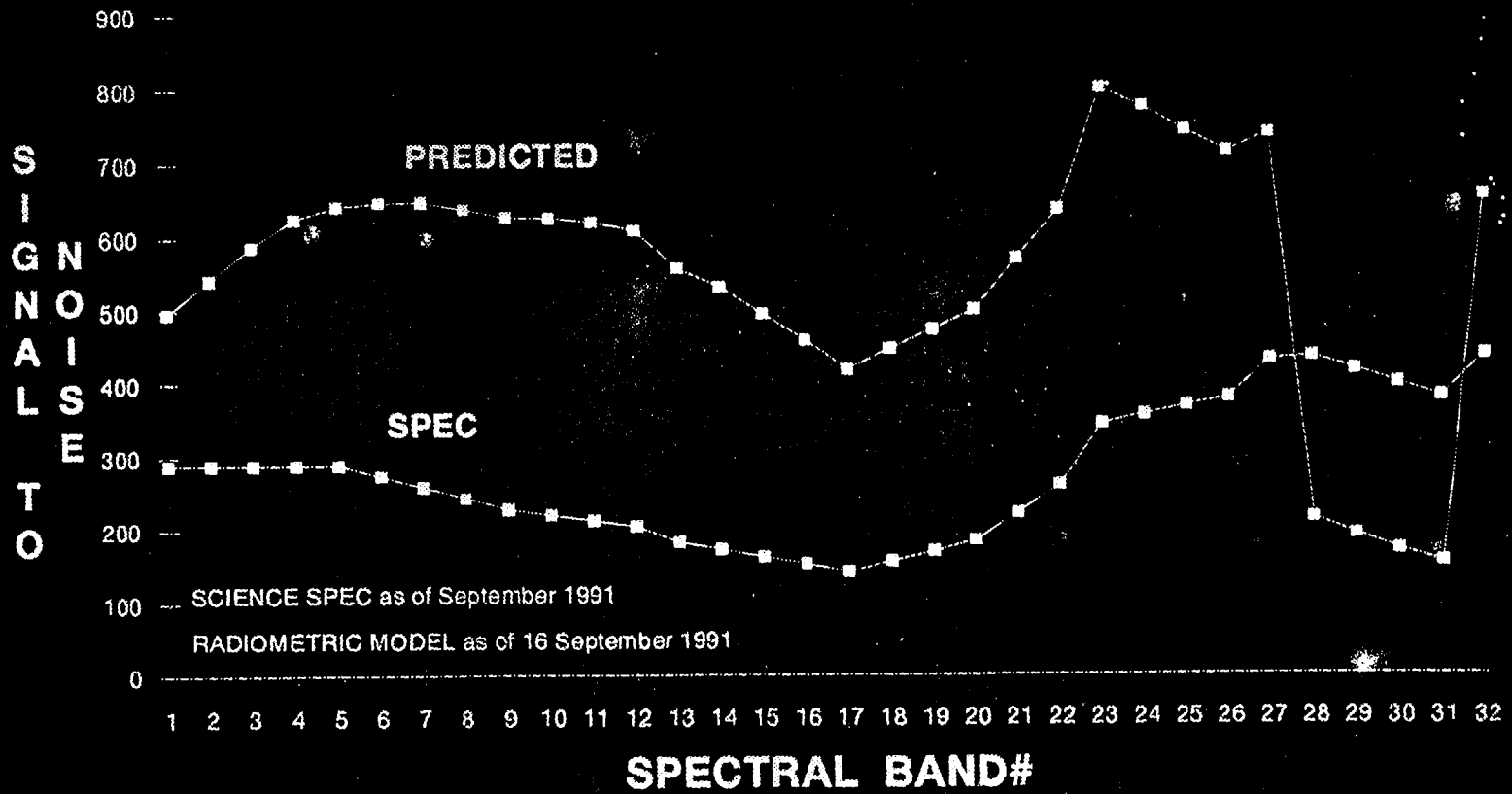


WRS-4F

# OCEAN PERFORMANCE



9/29/91  
WRS - 5



9/29/91  
WRS - 6

MODERATE RESOLUTION IMAGING SPECTROMETER  
TILT

Instrument Science Missions



Current Instrument Status

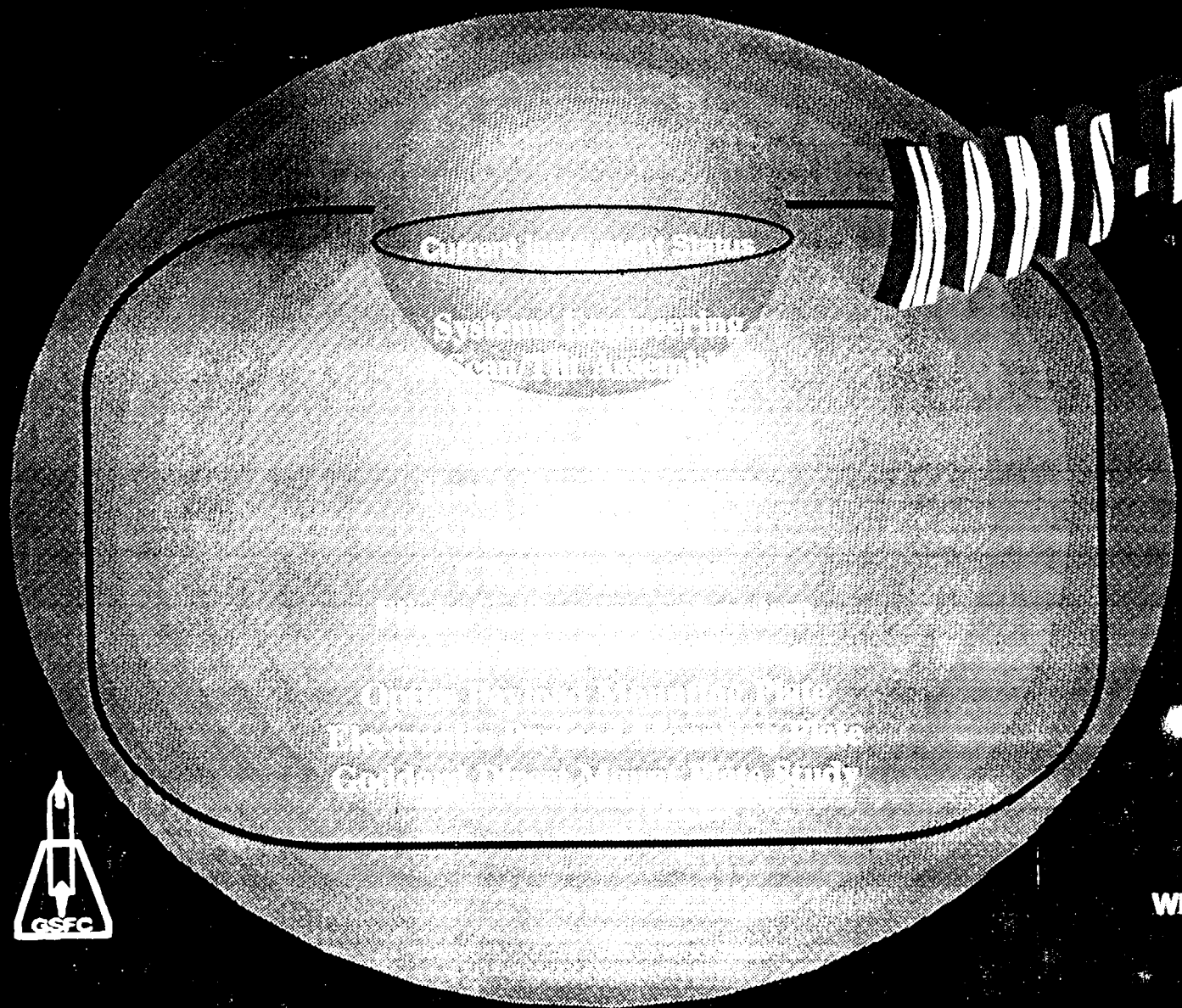
Programmatics



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5  
6



Current Instrument Status

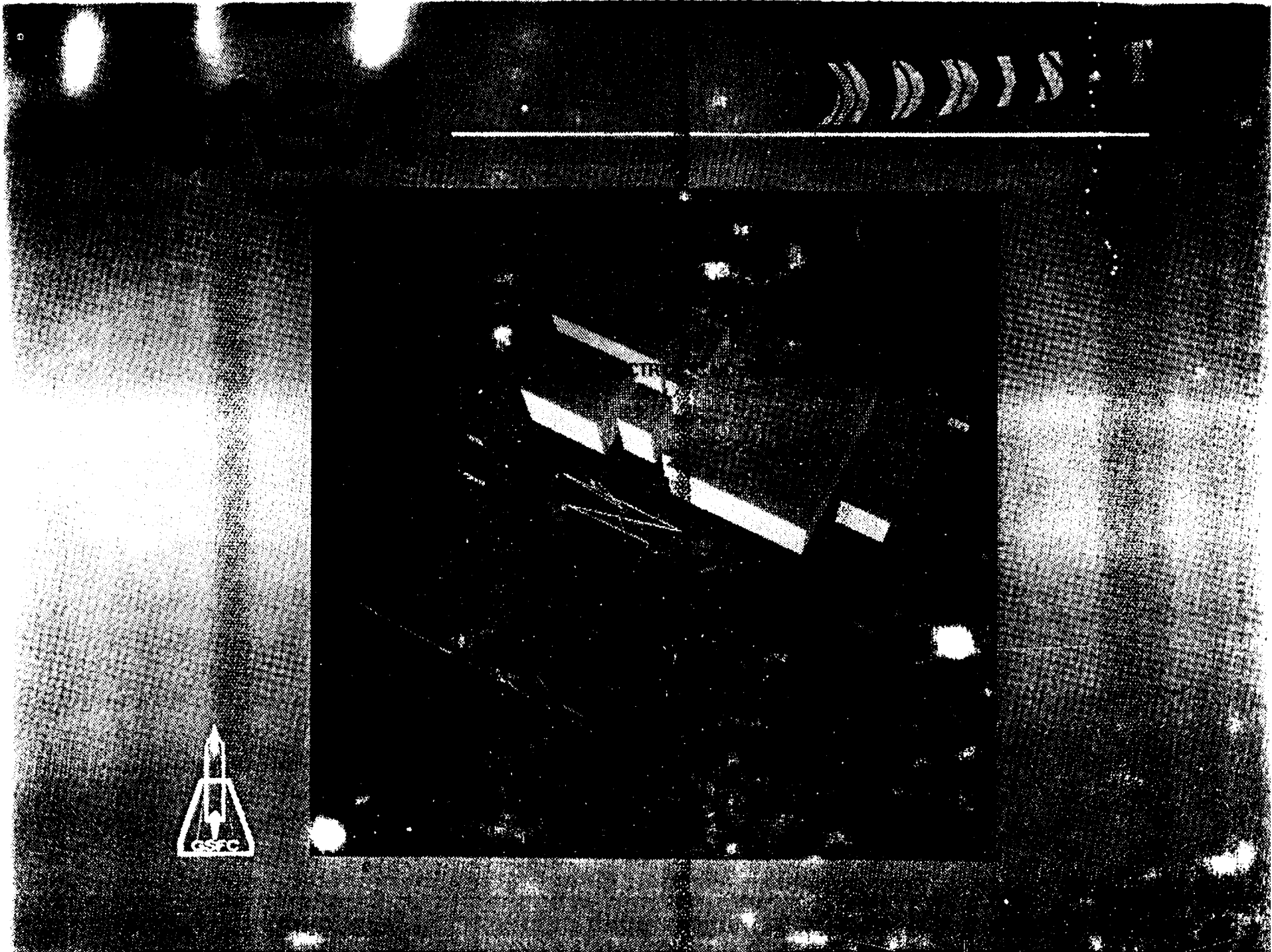
Systems Engineering  
Ocean/In-Assembly

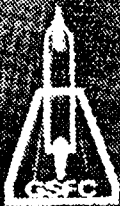
Electronics Development

Ocean/In-Assembly  
Electronics Development  
Goddard Ocean/In-Assembly Study

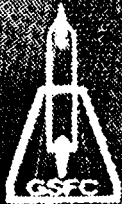
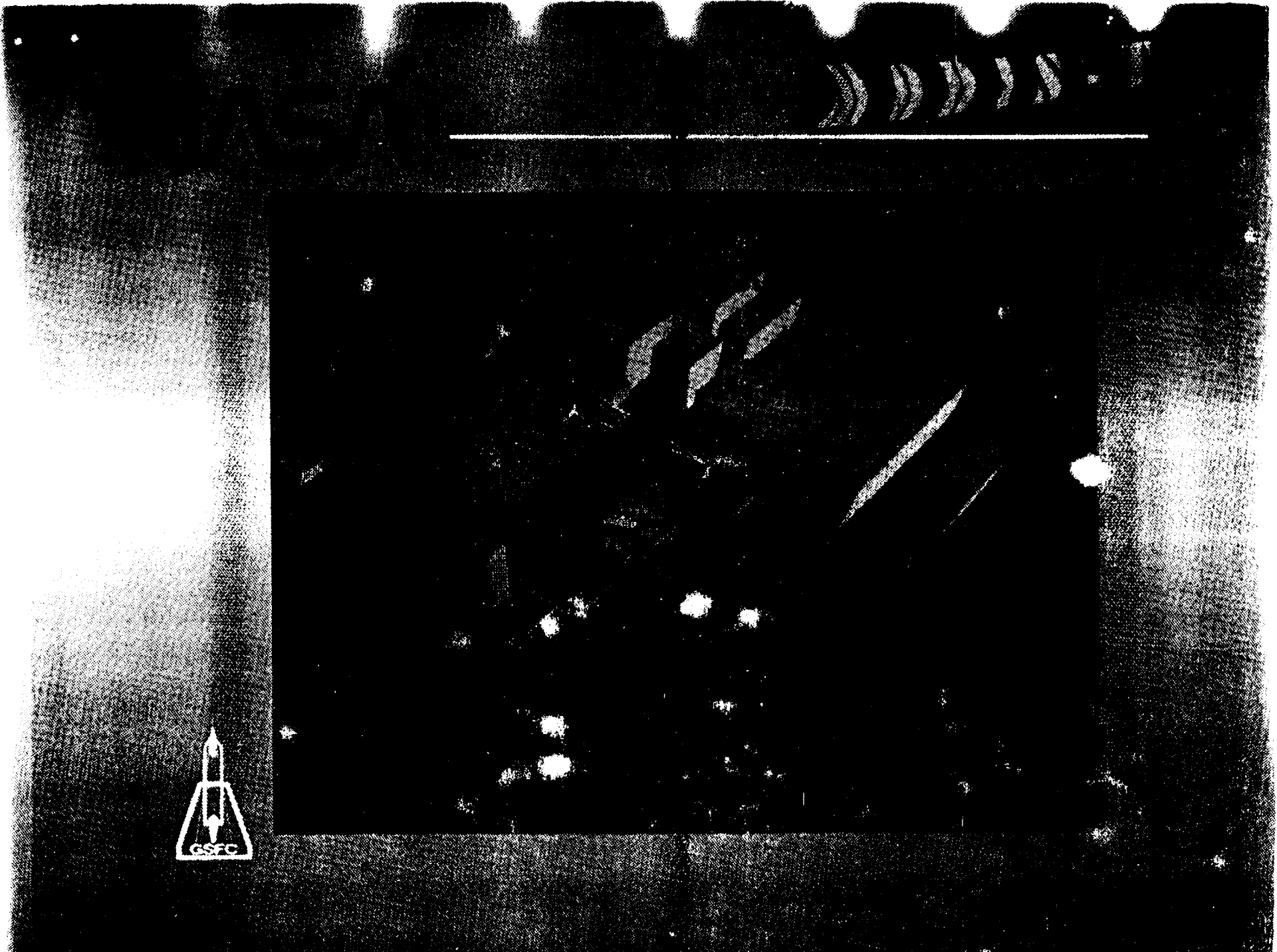


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WRS - 8





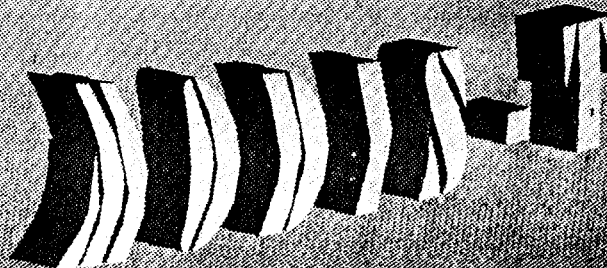
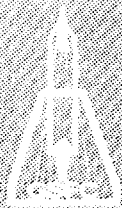
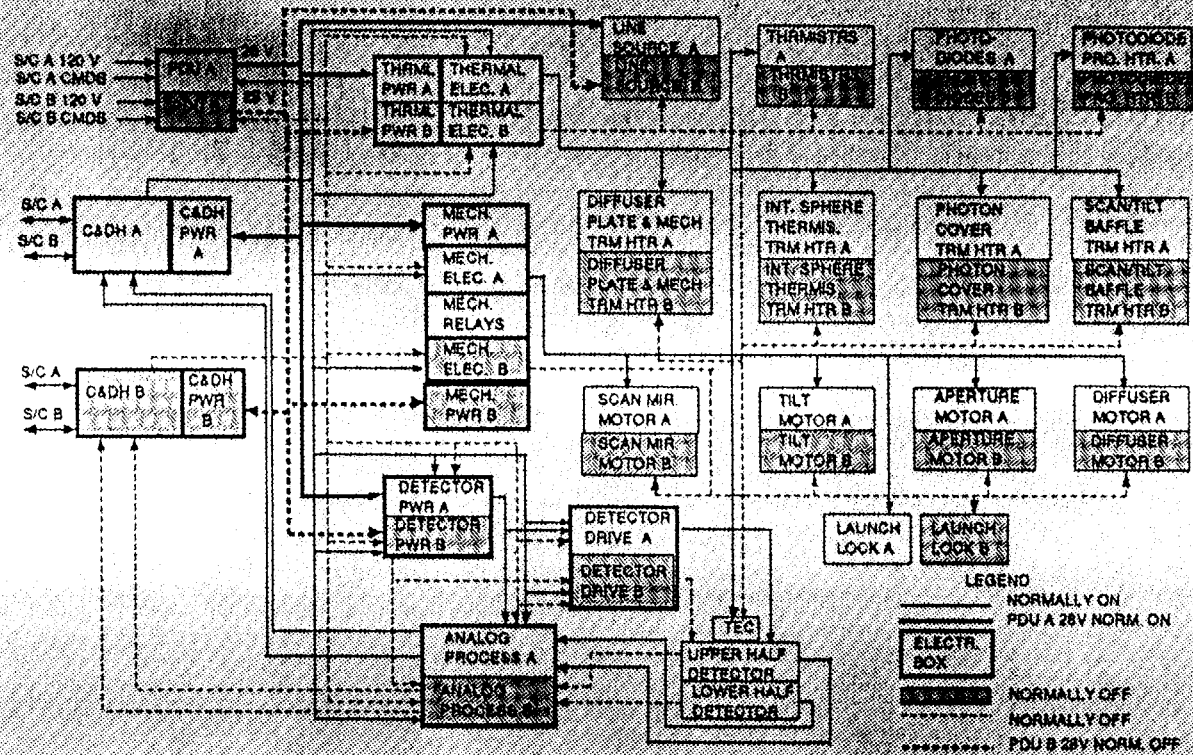






# SYSTEMS ENGINEERING

## SYSTEM BLOCK DIAGRAM



# **SYSTEMS ENGINEERING**

## **TELEMETRY DATA RATES**

	<b>BASELINE</b>	<b>NEW INSTRUMENT INTERFACE*</b>
<b>HIGH RATE TELEMETRY USING TAXI INTERFACE</b>	<b>3.1 MBits/SEC</b>	<b>3.3 MBits/SEC</b>
<b>HEALTH AND SAFETY TELEMETRY</b>	<b>1.1 KBits/SEC</b>	<b>1.1 KBits/SEC</b>

**\*Use J,K fillers between word transfers**

**TAXI = Transparent Asynchronous Xmitter Interface**

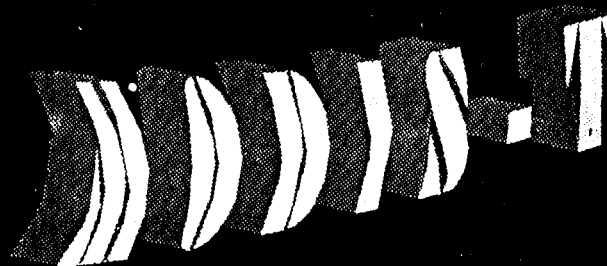
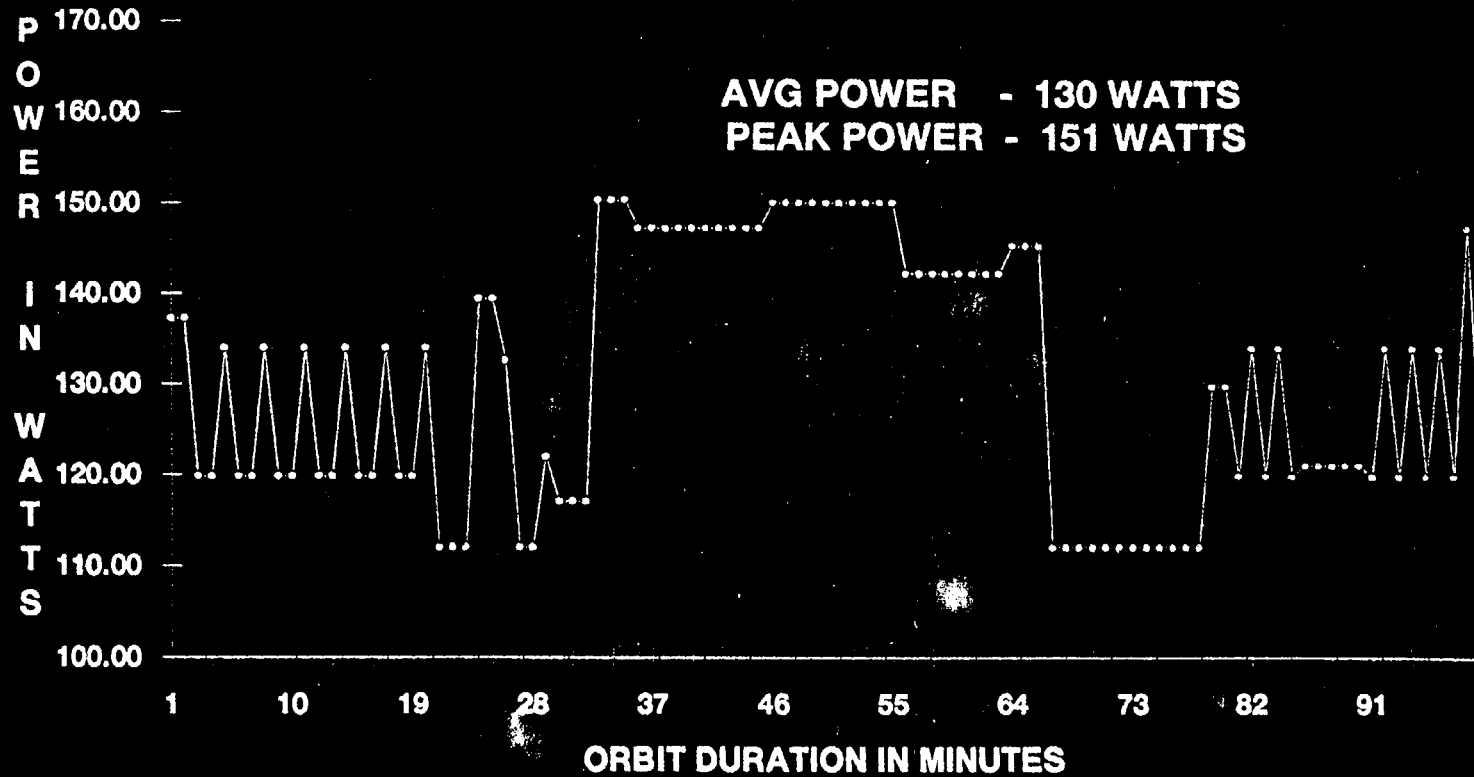


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# SYSTEMS ENGINEERING

## POWER BUDGET



9/29/31

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# SYSTEMS ENGINEERING

## WEIGHT BUDGET

ITEM	WEIGHT (lbs) (Allocated)	WEIGHT (lbs) (Estimated)	ITEM	WEIGHT (lbs) (Allocated)	WEIGHT (lbs) (Estimated)
MECHANISM DRIVE BOX	37.00	37.00	COLD PLATE SUPPORT	32.00	30.00
C&DH BOX A	32.50	32.50			
C&DH BOX B	32.50	32.50			
DETECTOR DRIVE BOX	8.50	7.50	OPTICS PLATE AND OPTICS	29.00	28.39
ANALOG PROCESSING BOX	3.00	2.91	PHOTON COVER	5.00	4.60
DETECTOR POWER SUPPLY BOX	15.00	15.00	DETECTOR	0.50	0.50
POWER DISTRIBUTION UNIT BOX	27.50	27.13	<b>OPTICS TOTAL</b>	<b>34.50</b>	<b>33.49</b>
THERMAL CONTROL BOX	10.00	10.00			
<b>ELECTRONIC BOXES</b>	<b>166.00</b>	<b>164.54</b>	THERMAL HEATERS AND SENSORS	15.00	14.00
			HARNESS	35.00	35.00
SCAN MECHANISM	12.50	11.29	MISCELLANEOUS	2.00	2.00
TILT MECHANISM	38.00	36.81	THERMAL, HARNESS, ETC.	52.00	51.00
DIFFUSER MECHANISM	14.00	13.00			
APERTURE MECHANISM	26.00	24.00			
<b>MECHANISM TOTAL</b>	<b>90.50</b>	<b>85.10</b>			

**NOTE:**

1. C&DH does not reflect new instrument interface
2. There is no margin in these numbers.

**TOTAL (LBS)**

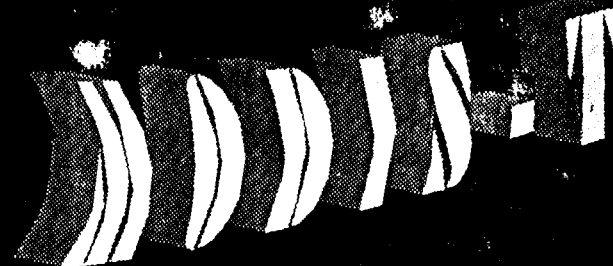
**375.00**

**364.13**

**TOTAL (kg)**

**170.07**

**165.14**



9/29/91

**WRS - 13**

## SCAN/TILT ASSEMBLY

**B/B scan drawings 100% complete - mechanism 20% complete**

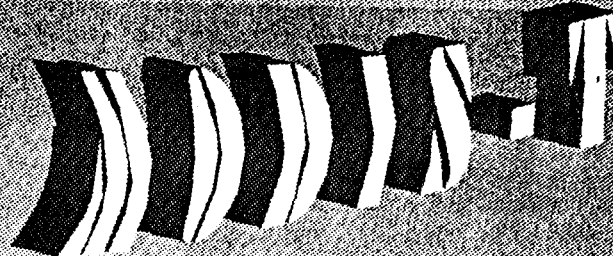
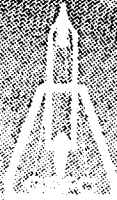
**B/B tilt drawings 99% complete - mechanism 20 % complete**

**B/B scan and tilt motors inhouse for testing**

**B/B electronics due in November 91**

**NASTRAN models of scan and tilt assemblies completed for optics plate or PMP mounting displacement, frequency, and stress analyses**

**Vacuum system designed for bearing life test facility**



## DIFFUSER ASSEMBLY

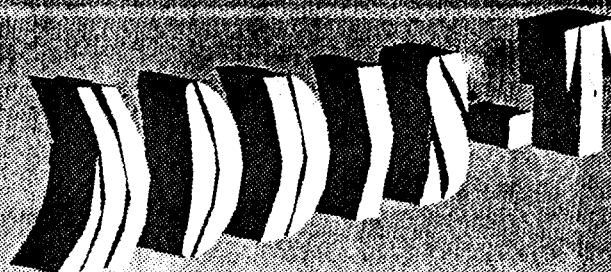
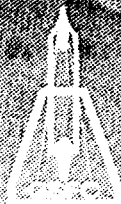
**B/B Trunion tower fabricated**

**B/B motor procured**

**B/B housing parts fabricated and available for assembly**

**Bench test equipment drawings completed for testing motor and arm action**

**Three reflective materials have been identified for diffuser plate**



9/30/81

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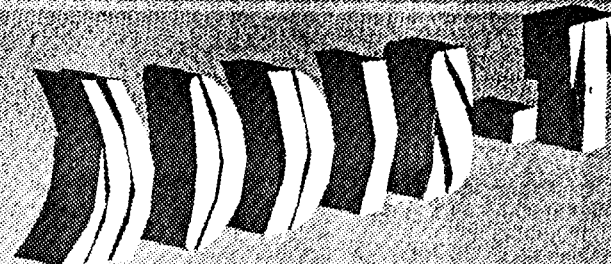
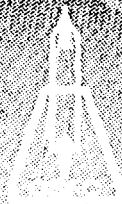


## APERTURE ASSEMBLY

**Fabrication drawings completed - assembly drawings due end of October 91**

**Optical encoder procurement due in October 91**

**Motor due in December 91**



9/30/91

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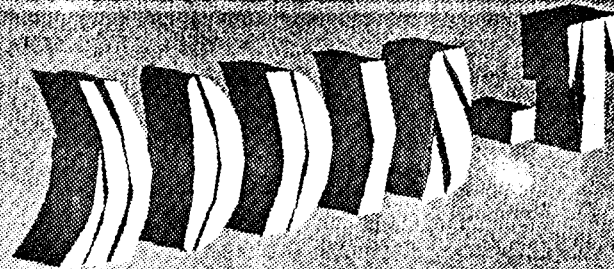
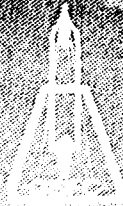
## FOCAL PLANE SUBSYSTEM

**Three lots of prototype (dual-mode) detectors designed and fabricated**

**15 detectors irradiated with 0.1, 1 and 10 times expected mission total dose of protons. Dark current increased 5X at room temperature, however, cooling to planned zero Celsius returned to acceptable level. Tests continue at ambient, zero, -15, -30, and -45 degrees Celsius to provide characterization data on the irradiated units.**

**B/B detector drive using a windowed (UV erasable) controller**

**B/B flight baselined E-squared (electronically erasable) controller due in November 91**



## POWER SUBSYSTEM

**Mechanism power supply design/fabrication in progress**

**Prepared to design/fabricate C&DH and Thermal power supplies**

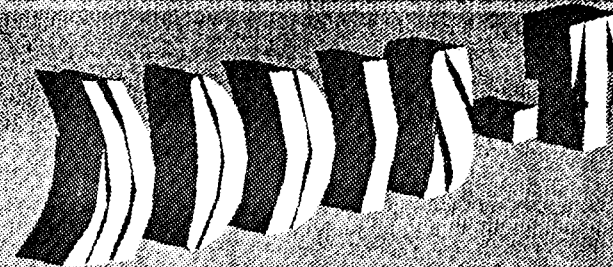
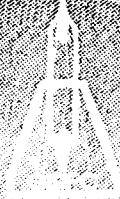
**Detector power supply for +5V and +/-15V fabricated and tested**

**Power Distribution Unit b/b power supply fabricated and operational**

**Designing turn-on circuit to meet GHS requirement change**

**Designed sheet metal mockup of flight PDU for flight harnessing design team**

**Breadboarded command & telemetry interfaces for instrument subsystems**



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## C&DH SUBSYSTEM

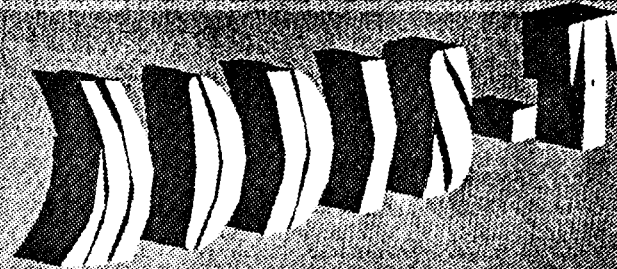
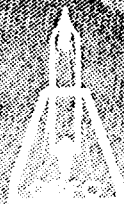
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**Finished assembly of breadboard components**

**Commenced testing of some b/b components**

**Fabricated three card cages: one for wire-wrapped memory, one for wire-wrapped CPU, one for the Buss Data Unit (BDU)**

**Preliminary software subsystem checkout routines coded**



3/30/61

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## **FLIGHT CALIBRATION SUBSYSTEM**

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**Baselined flight calibration system modeled by ray tracing and analysis**

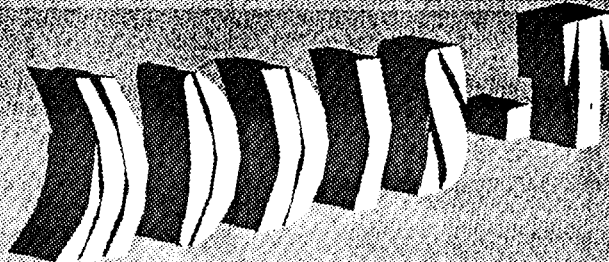
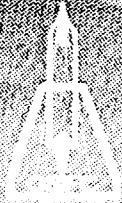
**Planned use of two/one integrating sphere concept**

**Centronics OSD100-5 silicon photodiode identified as candidate detector to be mounted in integrating sphere**

**MS-74 ultraviolet resistant coating identified for integrating sphere coating**

**Spectralon (Labsphere) pressed polytetrafluoroethylene powder baselined for two panels of the diffuser plate**

**B/B RF pumped helium line sources procured for spectral calibration**



9/31/91

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## SYSTEM INTEGRATION & TESTING

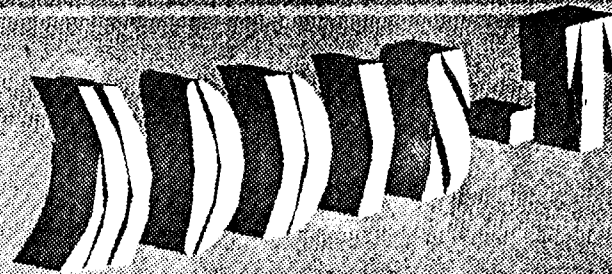
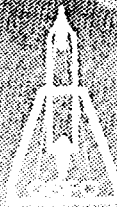
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**Engineering Unit prototyping of IGSE started - all units inhouse less high speed tape drive**

**System Test Operations Language (STOL) test plan drafted**

**STOL evaluations started on Operations and Science Instrument Support (OASIS) and on Transportable Payload Operations Control Center (TPOC) STOL (TSTOL)**

**Designs for hardware to implement real-time signature analysis of anomalous sensor data started**



9/30/01

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## OPTICS PMP COMPONENTS

**Anodized optics plate fabricated and available for buildup**

**Mirror mounts fabricated and mounting in progress**

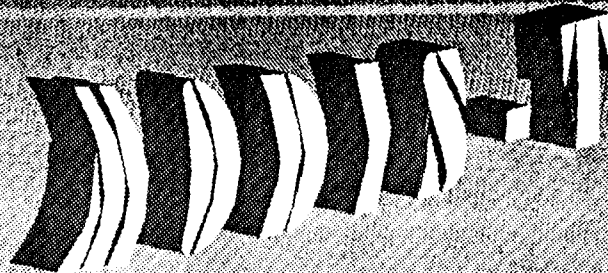
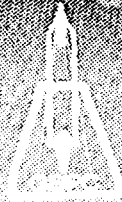
**Dummy B/B mirrors due in October 91**

**Thermal, pointing, and vibration test plan for NASTRAN model validation designed for upcoming tests**

**Schmidt camera rough alignment completed**

**Primary and Secondary off-axis parabolic mirrors (2 each) due from coating in October 91**

**Ruled grating fabricated - efficiency 60-70% with correct blaze angle at peak wavelength of 500nm**

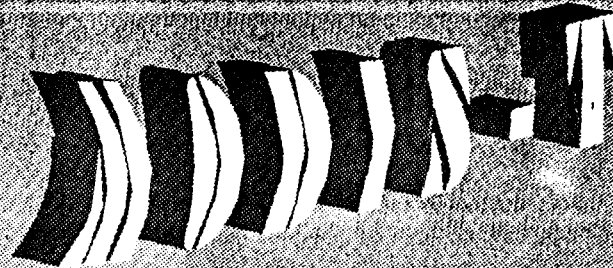
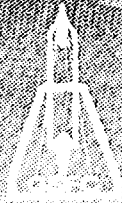


## **ELECTRONICS PMP BOXES**

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**Layout of electronics boxes on electronics payload mounting plate designed**

**Flight harness mockup of boxes in fabrication for harness analysis**



## **GODDARD DIRECT MOUNT PLATE STUDY**

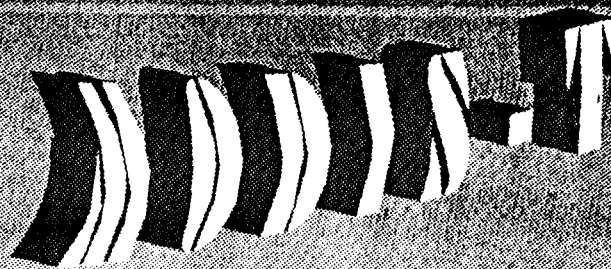
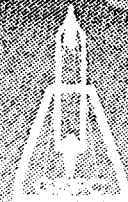
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**Due to inconsistencies between the mechanical requirements of the GE payload mounting plate and current instrument design a study was conducted to replace the GE PMP with an aluminum payload mounting plate**

**Predicted orbital thermal changes were analyzed for instrument on GE PMP - inconsistencies in fundamental frequency, pointing, and bolt load requirements were identified**

**The GHS option for direct mounting to the spacecraft was explored. The Goddard Direct Mount Plates were designed, analyzed and found to meet mechanical and pointing requirements of the instrument**

**A recommendation to replace the GE PMP with the GDMP was forwarded to project**



9/30/01

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MODERATE RESOLUTION IMAGING SPECTROMETER  
TILT

Instrument Science Missions

Current Instrument Status

Programmatic



9/29/91

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# ORGANIZATION CHART

**INSTRUMENT SCIENTIST**  
W.Barnes 925

**INSTRUMENT DEVELOPMENT  
MANAGER**  
W.Stobnow 721

**CHIEF SYSTEMS ENGINEER**  
M.Roberto 725

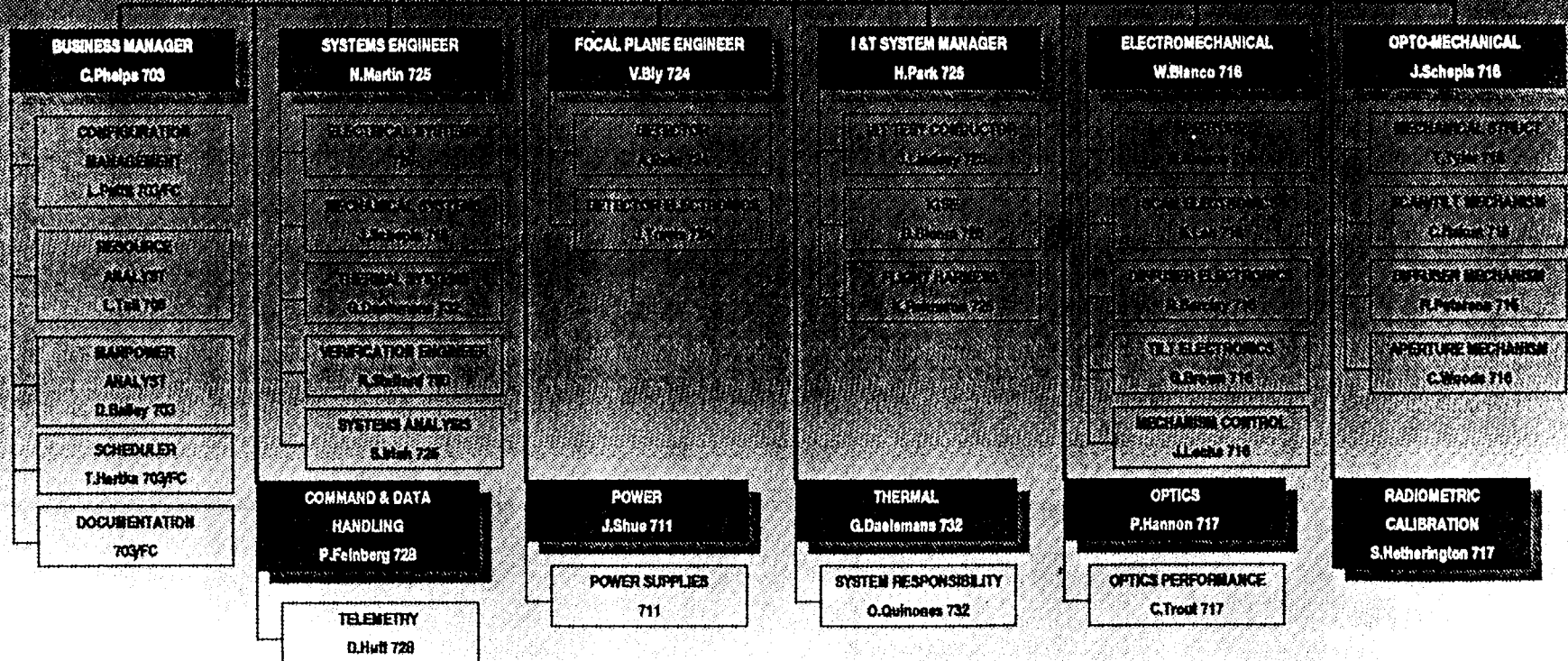
**PERFORMANCE ASSURANCE  
MANAGER**  
J.Buckner 303

**CONTAMINATION CONTROL  
MANAGER**  
S.Straka 732

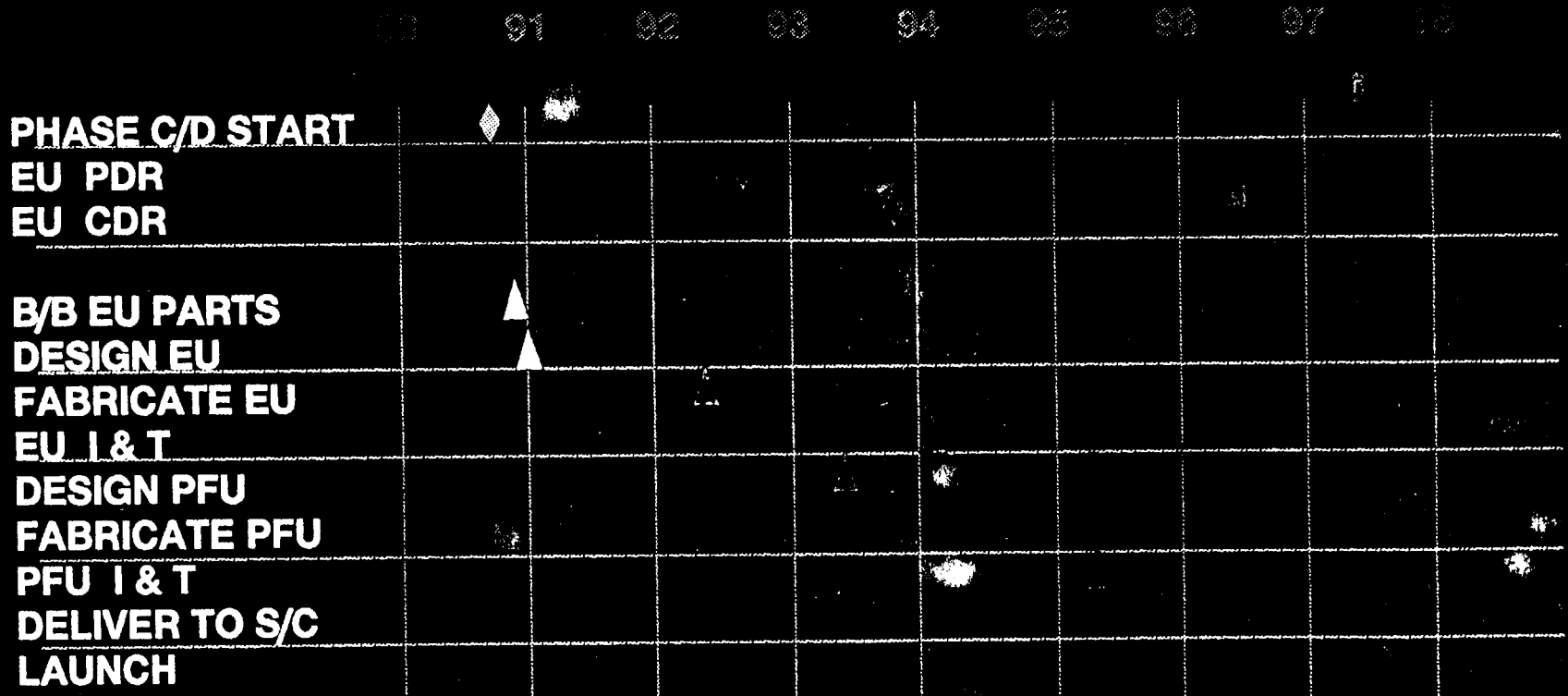
**INSTRUMENT ENGINEER**  
721

**I&T SUBSYSTEMS ENGR**  
C.Heidelbach 721/FC

**SOFTWARE SYSTEMS MGR**  
721



# MASTER SCHEDULE

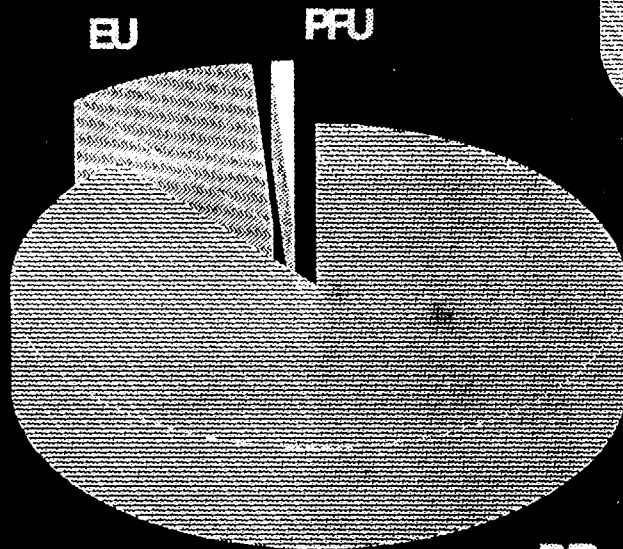


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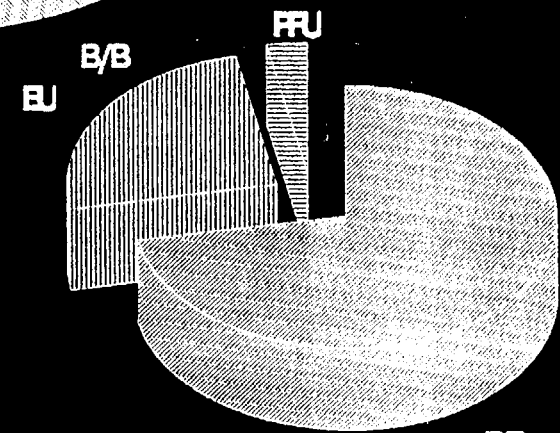
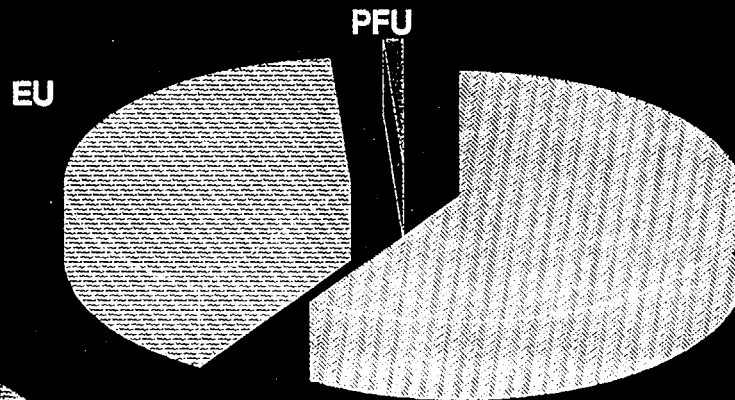
WRS - 26

# MANPOWER & COST ACTUALS

**HARDWARE**  
**\$1.451M**



**MANPOWER**  
**65 MYrs**



**CONTRACT SUPPORT**  
**\$3.468M**

9/29/91

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## **FUTURE DIRECTIONS**

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**EOS platform changes and new launch vehicle impacts are being explored with an eye toward repackaging the instrument for a more highly constrained spacecraft**

**Cost drivers in the science specification are being identified should it be desirable to rescope specific science requirements**

**Cost drivers in the engineering requirements, redundancy, engineering model, computer-based mechanism control, constant data rate to s/c are candidates for meeting austere budget constraints**

**Error budget allocations will be addressed to ensure they will, in fact, minimize total instrument costs**



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