FLIGHT SUMMARY REPORT
ASTEX

Flight #:	92-106		
Date:	12 June 1992		
Sensor Package:	Modis-N Airborne Simulator (MAS) Electro-Optic Camera (EOC) Radiation Measurement System (RAMS) Cloud Lidar System (CLS)		
Area(s) Covered:	Azores		
Investigator(s):	Spinhirne/King, NASA-GSFC	**Aircraft #:**	709
Flight Request:	2P22022	**Julian Date:**	92-164

SENSOR DATA

Accession #:	-----	-----	-----	-----
Sensor ID #:	108	111	112	113
Sensor Type:	MAS	EO Camera	RAMS	CLS
Focal Length:	-----	-----	-----	-----
Film Type:	-----	-----	-----	-----
Filtration:	-----	-----	-----	-----
Spectral Band:	See King configuration	-----	-----	-----
f Stop:	-----	-----	-----	-----
Shutter Speed:	-----	-----	-----	-----
# of Frames:	-----	-----	-----	-----
% Overlap:	-----	-----	-----	-----
Quality:	-----	Good	Good	Good
Remarks:	No data	-----	-----	-----

Atlantic Stratocumulus Transition Experiment

The Atlantic Stratocumulus Transition Experiment (ASTEX) was conducted as part of Project FIRE (First ISCCP Regional Experiment). This is an ongoing multi-agency program designed to promote the development of improved cloud and radiation parameterizations for use in climate models, and to provide for assessment and improvement of International Satellite Cloud Climatology Program (ISCCP) products. The objectives of FIRE field missions are to measure cloud and radiative properties over a wide range of spatial and temporal scales of cirrus and marine stratocumulus cloud systems.

Airborne Science and Applications Program

The Airborne Science and Applications Program (ASAP) is supported by three ER-2 high altitude Earth Resources Survey aircraft. These aircraft are operated by the High Altitude Missions Branch at NASA-Ames Research Center, Moffett Field, California. The ER-2s are used as readily deployable high altitude sensor platforms to collect remote sensing and *in situ* data on earth resources, celestial phenomena, atmospheric dynamics, and oceanic processes. Additionally, these aircraft are used for electronic sensor research and development and satellite investigative support.

The ER-2s are flown from various deployment sites in support of scientific research sponsored by NASA and other federal, state, university, and industry investigators. Data are collected from deployment sites in Kansas, Texas, Virginia, Florida, and Alaska. Cooperative international scientific projects have deployed the aircraft to sites in Great Britain, Australia, Chile, and Norway.

Photographic and digital imaging sensors are flown aboard the ER-2s in support of research objectives defined by the sponsoring investigators. High resolution mapping cameras and digital multispectral imaging sensors are utilized in a variety of configurations in the ER-2s' four pressurized experiment compartments. The following provides a description of the digital multispectral sensor used for data collection during this flight.

Modis-N Airborne Simulator -- Jedlovec Configuration

The Modis-N Airborne Simulator (MAS) is a modified Daedalus multispectral scanner. It records up to twelve 8-bit channels, which can be selected from an array of fifty available spectral bands. The band selection is made prior to flight and the instrument is hard-wired to that configuration. Channel 1 is used to store additional bits which provide 10-bit resolution for channels 9 through 12. The Jedlovec band configuration for the ASTEX Deployment is as follows:

Channel	Band edges μm
1	-------
2	0.529 - 0.572
3	0.688 - 0.729
4	0.810 - 0.852
5	0.852 - 0.893
6	0.926 - 0.969
7	3.659 - 3.810
8	12.539 - 12.986
9*	9.452 - 9.877
10*	10.259 - 10.725

11*	10.791 - 11.239
12*	11.799 - 12.246

* 10-bit resolution

Sensor/Aircraft Parameters

Spectral Channels:	50
Output Channels:	Seven 8-bit and four 10-bit
IFOV:	2.5 mrad
Ground Resolution:	163 feet (50 meters at 65,000 feet)
Total Scan Angle:	85.92°
Pixels/Scan Line:	716
Scan Rate:	6.25 scans/second
Ground Speed:	400 kts (206 m/second)
Roll Correction:	Plus or minus 3.5 degrees (approx.)

Modis-N Airborne Simulator -- King Configuration

The Modis-N Airborne Simulator (MAS) is a modified Daedalus multispectral scanner. It records up to twelve 8-bit channels, which can be selected from an array of fifty available spectral bands. The band selection is made prior to flight and the instrument is hard-wired to that configuration. Channel 1 is used to store additional bits which provide 10-bit resolution for channels 9 through 12. The King band configuration for the ASTEX Deployment is as follows:

Channel	Band edges *μm*
1	-------
2	0.635 - 0.688
3	0.852 - 0.893
4	0.926 - 0.969
5	1.595 - 1.652
6	2.126 - 2.173
7	3.659 - 3.810
8	13.630 - 14.147
9*	8.342 - 8.738
10*	10.791 - 11.239
11*	13.023 - 13.375
12*	11.799 - 12.246

* 10-bit resolution

Sensor/Aircraft Parameters

Spectral Channels:	50
Output Channels:	Seven 8-bit and four 10-bit
IFOV:	2.5 mrad
Ground Resolution:	163 feet (50 meters at 65,000 feet)
Total Scan Angle:	85.92°
Pixels/Scan Line:	716
Scan Rate:	6.25 scans/second
Ground Speed:	400 kts (206 m/second)
Roll Correction:	Plus or minus 3.5 degrees (approx.)

Electro-Optic Camera System

The NASA-Ames High Definition Electro-Optic Camera System (EOC) is an experimental sensor under development by the High Altitude Missions Branch at NASA-Ames Research Center. The system captures high resolution digitized images from a solid-state video camera and stores the imagery on magnetic tape. System characteristics are as follows:

CCD Video Camera	
IFOV:	0.2 mrad
Ground Resolution:	15.8 feet (4.81 meters at 65,000 feet)
Total Scan Angle:	13.96^{o}
Swath Width:	3.3 nmi (6.2 km) x 2.7 nmi (4.9 km) at 65,000 feet
Spectral Coverage:	400-900 nm
Frame Size:	1280 pixels x 1025 pixels
Lens (Interchangeable):	28 mm
Shutter Speed:	Selectable
Aperture:	f/2.8
Filtration:	4 and 6 position filter wheels (4 and 6 spectral filters) Polarizing Filter
Tracking Capability:	Tilt 45^{0} fore and aft
Data Collection	
Frame Rate:	1 image every 3 seconds
Frame Overlap:	90% (to 40% w/6 filters)
Data Storage:	Tape Cassette
Capacity:	5.0 Gbytes

For additional information contact Ted Hildum at NASA-Ames Research Center, Mail Stop 240-6, Moffett Field, California 94035-1000.

Radiation Measurement System

The Radiation Measurement System (RAMS) is an integrated system of several radiometers. The system provides airborne measurements to support analysis and theoretical calculations of cloud properties and radiation fields and to provide validation of satellite radiance measurements. The airborne instruments consist of the following:

1. an electrically calibrated pyroelectric radiometer for hemispherical, broad spectral bandpass, radiative flux measurements in the solar spectral region (0.26 to 2.6 μm). This radiometer has two detectors. One is located on the upper Q-bay hatch and the down-looking instrument is located on the lower E-bay hatch;

2. an IR net flux radiometer (rotating) radiometer covering the spectral range from 5 to 40 μm. This radiometer is mounted on the S20 location on the right wing;

3. a narrow field-of-view, narrow spectral bandpass IR radiometer (2 channels in the 5 to 40 μm region). This radiometer uses a liquid nitrogen cooled black body reference. This instrument provides upwelling infrared intensities above cloud. It is mounted on the lower Q-bay hatch; and

4. a total-direct-diffuse multichannel narrow spectral bandpass (about 5 to 10 nm) flux radiometer. This radiometer is used for optical depth determinations and direct/diffuse

ratios. The up-looking detector is mounted on the upper Q-bay hatch and the down-looking detector is located on the lower E-bay hatch.

The data system and radiometer electronics are located on the upper Q-bay rack.

For additional information regarding this system contact Francisco P.J. Valero, Atmospheric Physics Research Branch, NASA-Ames Research Center, Mail Stop 245-4, Moffett Field, CA 94035-1000.

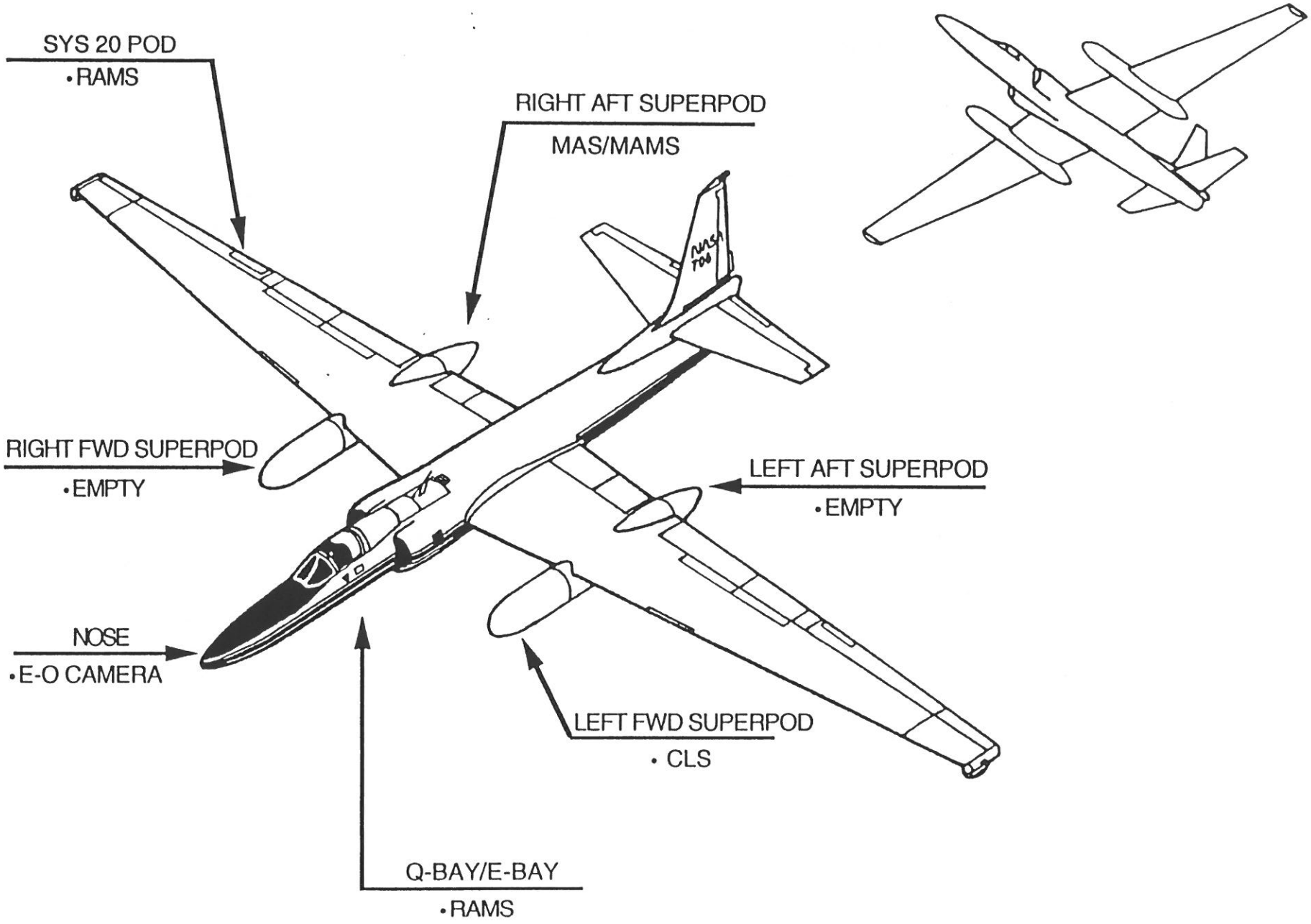
Cloud Lidar System

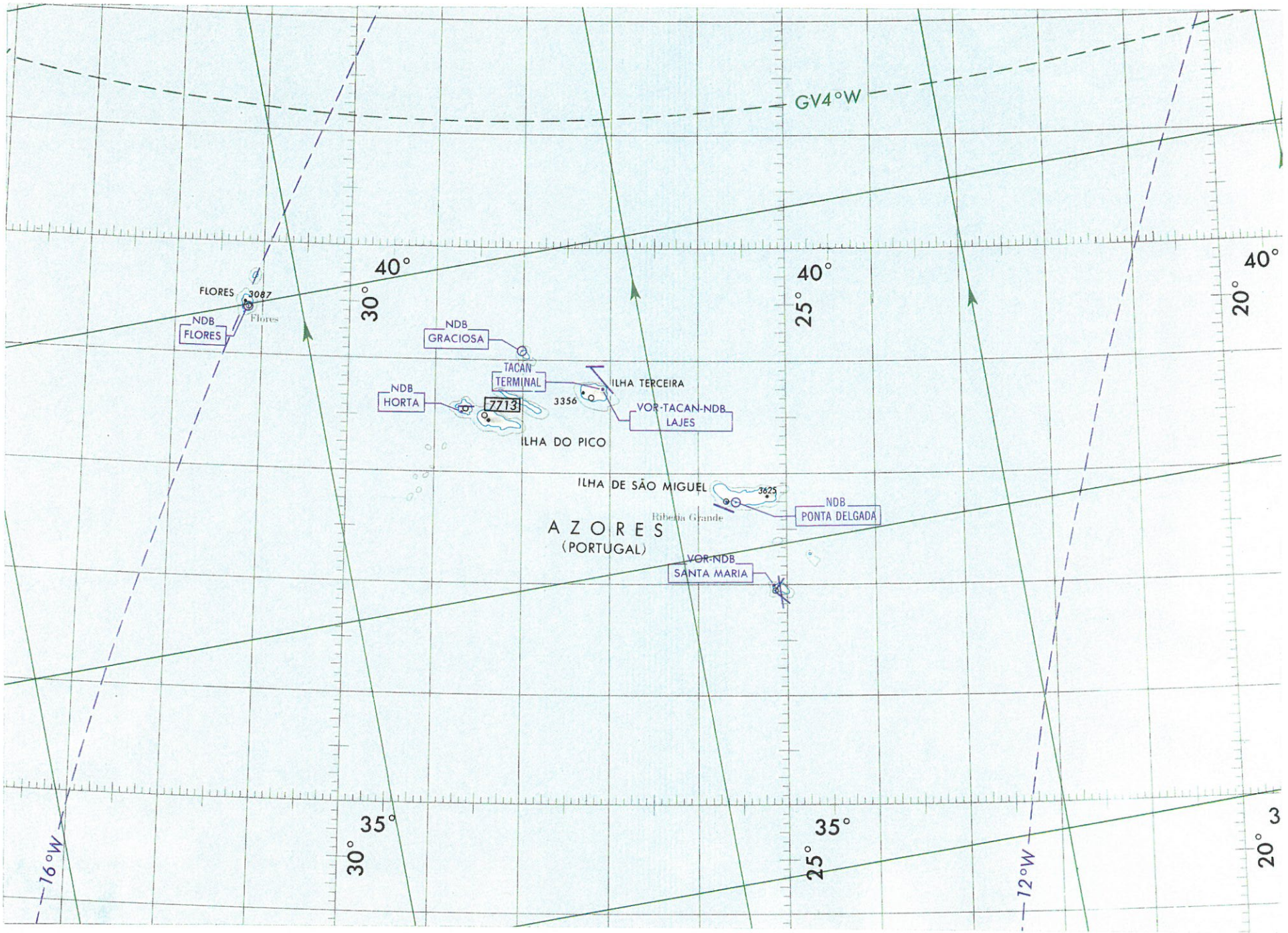
The Cloud Lidar System (CLS) is flown on the ER-2 to conduct cloud radiation and severe storm field experiments. Designed to operate at high altitudes in order to obtain measurements above the highest clouds, the instrument provides the true height of cloud boundaries and the density structure of less dense clouds. The height structure of cirrus, cloud top density and multiple cloud layers may also be profiled. System specifications are as follows:

Transmitter	
Laser Type:	Nd:YAG I,II
Wavelength:	1064, 532 nm
Pulse Energy:	90, 30 mJ
PRF:	10 Hz
Beamwidth:	1 mrad
Data Acquisition:	Measurements at 20m intervals at 200 m/sec aircraft speed
Receiver	
Diameter:	0.15 m
Beamwidth:	1.4 mrad
Polarization:	v & h
Data System	
Range Resolution:	7.5 m
Number of Channels:	4
Samples per Channel:	3310
Record Capacity:	8 hours

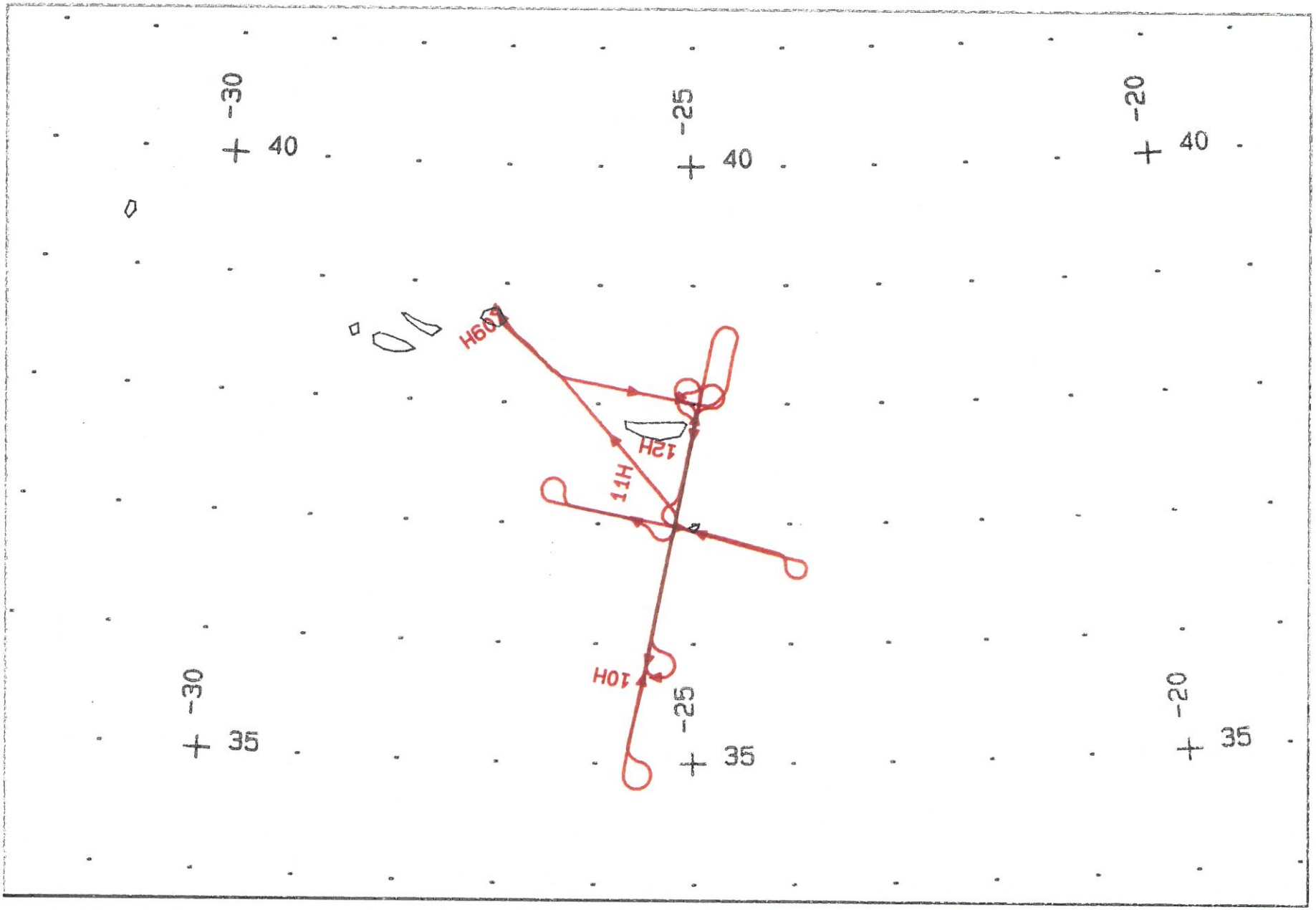
For additional information regarding this instrument contact Dr. James Spinhirne, NASA-Goddard Space Flight Center, Code 917, Greenbelt, MD 20771.

ASTEX CONFIGURATION





ASTEX AZORES DEPLOYMENT - 31 MAY TO 30 JUNE 1992



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