

# SUBORBITAL SCIENCE PROGRAM

# CARTA

## Flight Summary Report

March 8 to March 29, 2003



National Aeronautics and  
Space Administration

Ames Research Center  
Moffett Field, California 94035

Johnson Space Center  
Houston, Texas 77034

Dryden Flight Research Center  
Edwards, California 93523

Airborne Sensor Facility  
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<http://asapdata.arc.nasa.gov>

# **CARTA**

## **Costa Rica Airborne Research and Technology Applications**

### **Flight Summary Report March 8 to March 29, 2003**

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03-003-07	19 March	AVEMS data flight No camera or MASTER data collected
03-003-08	20 March	Costa Rica
03-003-09	21 March	Gulf of Nicoya/Mt. Arenal
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## **Costa Rican Airborne Research and Technology Applications (CARTA)**

The CARTA project is a collaborative effort between the Centro Nacional de Alta Tecnologia (CENAT) of Costa Rica and the National Aeronautics and Space Administration (NASA). The project's objectives are to acquire airborne multispectral digital imagery, photographic data and *in-situ* volcanic emissions measurements over Costa Rica for the following objectives:

- Assess land use/land cover to assist in developing land use policy and a land use database
- Tropical forest ecosystems research
- Tropical agricultural research
- Study volcanic activity and volcanic hazards
- Urban and regional planning
- Update national cartographic database
- Measure volcanic emissions to advance scientific research on volcanic activity and understand effect of emissions on air quality

In support of the CARTA Project, NASA deployed a High Altitude WB-57 aircraft from March 8 to March 29, 2003 to San Jose, Costa Rica. The WB-57 acquired MODIS/ASTER Airborne Simulator (MASTER) multi-spectral digital imagery and Leica RC-10 metric camera color infrared aerial photography over the entire country. Additionally an Airborne Volcanic Emissions Mass Spectrometer (AVEMS) was flown to acquire *in situ* measurements of plumes emitted from selected volcanoes located in the central uplands of Costa Rica.

During the CARTA deployment the NASA WB-57 flew twelve missions to acquire imagery and *in situ* data over Costa Rica. This flight summary report describes each mission and graphically portrays areas covered during each flight.

## **NASA Suborbital Science Program**

The National Aeronautics and Space Administration maintain a variety of aircraft and sensor systems dedicated to the support of remote sensing research. Two Lockheed ER-2s (S-model U-2); two WB-57 high altitude aircraft; a DC-8; and a U.S. Dept. of Energy Beechcraft B-200 aircraft provide multi-level platforms for both NASA and investigator-owned sensors. Data are collected for the atmospheric, land, and ocean processes in support of the NASA Earth Science program, as well as for universities and other government agencies. Several of these systems are being used to validate algorithms for the NASA Earth Observing System.

The NASA aircraft, located at Dryden Flight Research Center and Johnson Space Center, are used as test-beds for advanced sensor design and satellite simulation, as well as to support scientific and operational data collection campaigns. Numerous sensor systems are in use and under development by NASA, including multispectral imaging devices, a SAR system, and a suite of large-format mapping cameras. All instruments are spectrally, spatially, and radiometrically calibrated on a routine basis. The aircraft

themselves are equipped with navigation systems that continuously record GPS location and platform attitude data.

### **MASTER (MODIS/ASTER Airborne Simulator)**

The MASTER is similar to the MAS, with the thermal bands modified to more closely match the NASA EOS ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer) satellite instrument, orbiting on NASA's Terra satellite. It is intended primarily to study geologic and other Earth surface properties. MASTER is capable of flying on both high and low altitude aircraft. Its fifty spectral bands are configured as follows:

Spectral Channel	Band center (μm )	Bandwidth (μm )	Spectral Range
1	0.460	0.04	0.440-0.480
2	0.500	0.04	0.480-0.520
3	0.540	0.04	0.520-0.560
4	0.580	0.04	0.560-0.600
5	0.660	0.06	0.630-0.690
6	0.710	0.04	0.690-0.730
7	0.750	0.04	0.730-0.770
8	0.800	0.04	0.780-0.820
9	0.865	0.04	0.845-0.885
10	0.905	0.04	0.885-0.925
11	0.945	0.04	0.925-0.965
12	1.625	0.05	1.600-1.650
13	1.675	0.05	1.650-1.700
14	1.725	0.05	1.700-1.750
15	1.775	0.05	1.750-1.800
16	1.825	0.05	1.800-1.850
17	1.875	0.05	1.850-1.900
18	1.925	0.05	1.900-1.950
19	1.975	0.05	1.950-2.000
20	2.075	0.05	2.050-2.100
21	2.160	0.05	2.135-2.185
22	2.210	0.05	2.185-2.235
23	2.260	0.05	2.235-2.285
24	2.3295	0.065	2.297-2.362
25	2.3945	0.065	2.362-2.427

Spectral Channel	Band center (μm )	Bandwidth (μm )	Spectral Range
26	3.150	0.15	3.075-3.225
27	3.300	0.15	3.225-3.375
28	3.3450	0.15	3.375-3.525
29	3.600	0.15	3.525-3.675
30	3.750	0.15	3.675-3.825
31	3.900	0.15	3.825-3.975
32	4.050	0.15	3.975-4.125
33	4.200	0.15	4.125-4.275
34	4.375	0.15	4.275-4.425
35	4.500	0.15	4.425-4.575
36	4.650	0.15	4.575-4.725
37	4.800	0.15	4.725-4.875
38	4.950	0.15	4.875-5.025
39	5.100	0.15	5.025-5.175
40	5.250	0.15	5.175-5.325
41	7.900	0.4	7.70-8.10
42	8.300	0.4	8.10-8.50
43	8.700	0.4	8.50-8.90
44	9.100	0.4	8.90-9.30
45	9.700	0.4	9.50-9.90
46	10.100	0.4	9.90-10.30
47	10.625	0.65	10.30-10.95
48	11.300	0.7	10.95-11.65
49	12.050	0.5	11.80-12.30
50	12.750	0.5	12.50-13.00

Sensor/Aircraft Parameters:

Spectral Bands: 50 (16-bit resolution)  
 IFOV: 2.5 mrad  
 Swath width: 19.9 nmi (36 km) at 65,000 ft  
 Ground Resolution: 12-50 meters (variable w/ altitude)  
 Total FOV: 85.92 degrees  
 Pixels/Scanline: 716  
 Scan Rate: 6.25 - 25 Hz

(See the homepage at [asterweb.jpl.nasa.gov](http://asterweb.jpl.nasa.gov))



### **Aerial Camera Systems (ARC)**

The ER-2 can carry a variety of film camera systems. Several of these cameras are calibrated for precision photogrammetry, and the film may be used to generate digital ortho-photos or high-resolution digital elevation models.

<b>Camera Type</b>	<b>Lens</b>	<b>Film Format</b>	<b>Ground Coverage</b>	<b>Nominal Resolution</b>	<b>Scale</b>
RC-10	6"/f4	9" X 9"	30 X 30km	3.0-8.0m	1:130,000
RC-10	12"/f4	9" X 9"	15 X 15km	1.5-4.0m	1:65,000
HR-732	24"/f8	9" X 18"	7.4 X 15km	0.6-3.0m	1:32,500
IRIS (Panoramic)	24"/f3.5	4.5" X 35"	3.7 X 40km (Nadir)	0.3-2.0m	1:32,500

Note: Spatial parameters are for the ER-2 at 19.8km altitude; actual resolution is a function of target contrast. Missions are typically flown with 60% forward frame overlap for stereo coverage. RC-30 cameras are also available on the Dept. of Energy aircraft.

(See the homepage at <http://asapdata.arc.nasa.gov/Sensors.htm>)

### **Aircraft-based Volcano Emissions Mass Spectrometer, AVEMS**

The Aircraft-based Volcano Emissions Mass Spectrometer, AVEMS measures pollutants in the air as well as the composition of the air. The measurements can be used to determine pollution levels at altitudes ranging from ground level to 40,000 feet. AVEMS can also measure the compounds that are typically emitted from volcanoes. It is anticipated that *in-situ* monitoring of volcano emissions will help scientists to better understand volcanic activity. While the system was designed to fly aboard aircraft it can also be transported by hand or automobile.

The AVEMS system incorporates a mass spectrometer to measure the compounds of interest. The mass spectrometer can measure most compounds of interest ranging in mass from 1 to 200 Daltons (Da). The system is completely controlled by an embedded computer making the entire operation autonomous. The only input that is required of the operator is to turn the power switch on. The power-on switch initiates the system to start analysis. All of the data is stored to a flash disk for download at a later date. The system includes a fault indicator for the operator.

The specifications for the NASA/KSC AVEMS are:

- weighing less than 105 pounds (48 kg)
- size is less than 93,000 cm<sup>3</sup> (5,650 in<sup>3</sup>)
- capable of monitoring 16 gases simultaneously
- mass range from 1 to 200 Da
- permanent gases can be measured below 50 ppm
- volatile organics generally measured in the 10-ppm range
- 640 W of start-up power and 295 W at steady state
- operating temperature range of 25 to – 60°C
- operating pressure 760 to 50 torr
- flight certified for stress and EMI
- autonomous in operation.

The AVEMS has successfully been used to monitor volcanic emissions from aircraft and ground. The system has been carried into volcanoes to monitor the emissions. AVEMS has also monitored air quality around cities. The system has demonstrated many technologies useful for portable monitoring systems useful for Shuttle, ISS, and future vehicles. Research Staff: Timothy Griffin, Richard Arkin, Ric Adams, Charles Curley, and Duke Follistein.

Point of Contact: Timothy Griffin, AST Materials Scientist, Test and Analysis Branch, NASA Kennedy Space Center, (321)867-6755, [timothy.p.griffin@nasa.gov](mailto:timothy.p.griffin@nasa.gov)

### **Data Availability**

Photographic and digital imagery data collected by these systems is publicly available through U.S. Government agencies. Archives exist at the EROS Data Center of the U.S. Geological Survey in Sioux Falls, South Dakota; and within the NASA EOS-DAACs (Earth Observing System - Distributed Active Archive Centers)

### **Airborne Sensor Facility**

The Airborne Sensor Facility at NASA Ames Research Center web site:

<http://asapdata.arc.nasa.gov/>

Additional information regarding flight documentation to include archive searches may be obtained from the following:

Airborne Sensor Facility  
MS 240-6  
NASA Ames Research Center  
Moffett Field, CA 94035  
Telephone: (650)604-6252 (FAX 4987)

## FLIGHT SUMMARY REPORT

**Flight Number:** 03-003-02

**Calendar/Julian Date:** 08 March 2003 (067)

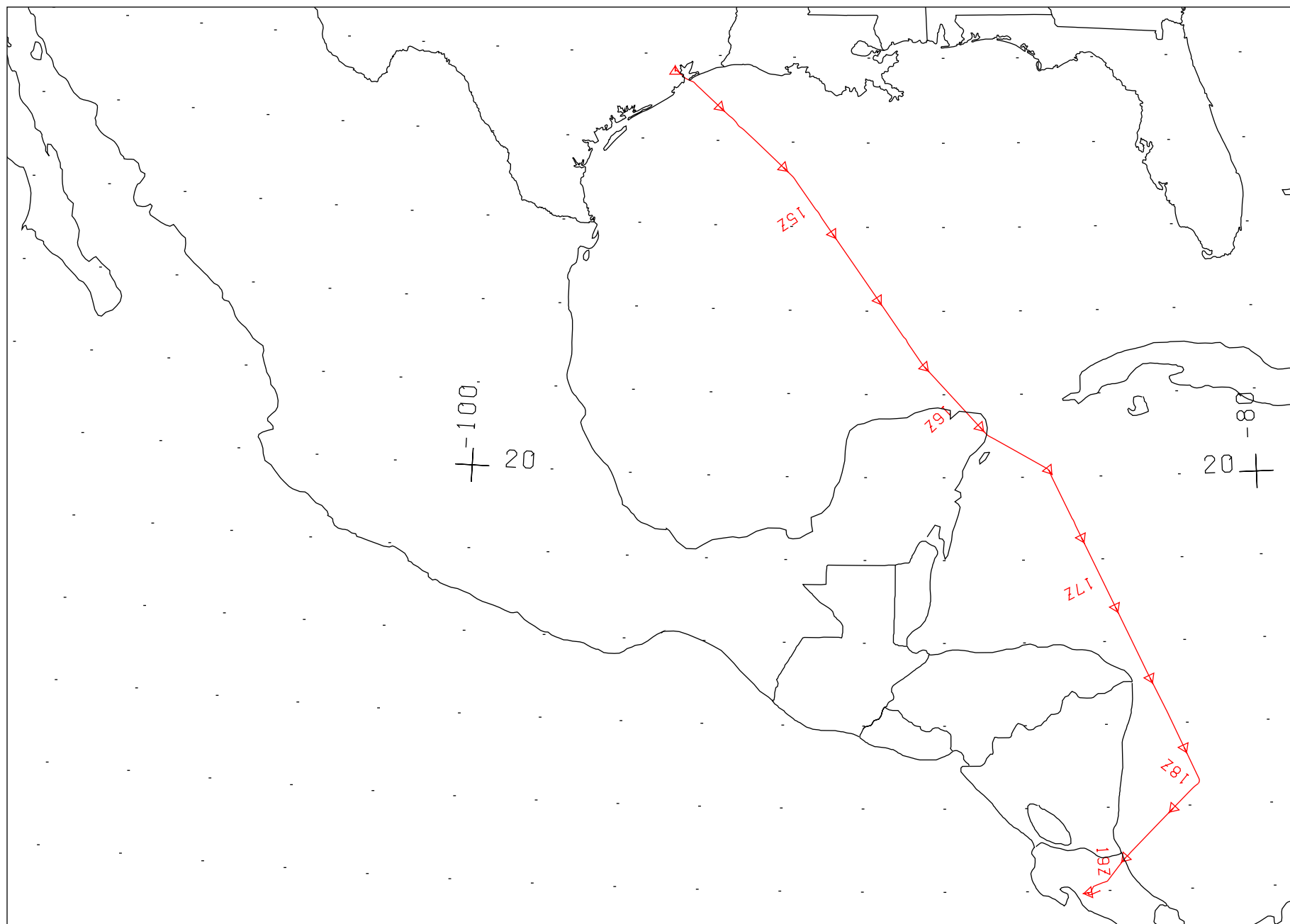
**Sensor Package:** MODIS/ASTER Airborne Simulator (MASTER)  
Airborne Volcanic Emissions Mass Spectrometer (AVEMS)

**Area(s) Covered:** Gulf of Mexico/Caribbean Sea

**Investigator(s):** Ferry to Costa Rica      **Aircraft Number:** 926  
NASA JSC WB-57

## SENSOR DATA

<b>Accession #:</b>	-----	-----
<b>Sensor ID #:</b>	124	139
<b>Sensor Type:</b>	MASTER	AVEMS
<b>Focal Length:</b>	-----	-----
<b>Film Type:</b>	-----	-----
<b>Filtration:</b>	-----	-----
<b>Spectral Band:</b>	-----	-----
<b>f-Stop:</b>	-----	-----
<b>Shutter Speed:</b>	-----	-----
<b># of Frames:</b>	-----	-----
<b>% Overlap:</b>	-----	-----
<b>Quality:</b>	-----	-----
<b>Remarks:</b>		



FLIGHT 03-003-02

8 MARCH 2003

A/C 926

MASTER

MODIS/ASTER AIRBORNE SIMULATOR (MASTER) FLIGHT LINE INFORMATION  
 FOR 08 Mar 2003  
 NASA FLIGHT NUMBER 03-003-02

FLTL	SITE	LINE	RUN	START OF FLIGHT LINE			END OF FLIGHT LINE			FLIGHT DATA				
				TIME HH:MM:SS	LAT DEG	LON DEG	TIME HH:MM:SS	LAT DEG	LON DEG	SCAN LINES	SOLAR ZEN	AZIM	HEAD DEG	ALT M (MSL)
1	GOM	01	1	14:29:51	28.801	-93.951	14:32:43	28.597	-93.691	1074	65.7	110.8	145.71	12514
2	GOM	02	1	14:36:30	28.327	-93.378	14:42:38	27.653	-92.521	3651	63.1	112.3	138.42	12521
3	GOM	03	1	14:46:17	27.652	-92.521	15:02:34	26.413	-91.335	6079	58.8	115.0	148.19	12511
4	GOM	04	1	15:03:10	26.370	-91.288	15:29:56	24.268	-89.671	9999	52.5	119.0	152.43	12540
5	GOM	04	2	15:29:56	24.268	-89.671	15:40:44	23.403	-89.020	4036	47.2	122.6	154.59	12567
6	GOM	05	1	15:42:03	23.302	-88.930	16:04:00	21.640	-87.454	8204	42.2	126.7	154.53	12566
7	CAR	01	1	16:12:35	21.027	-86.855	16:29:22	20.203	-85.339	6275	34.6	135.3	128.49	12569
8	CAR	02	1	16:30:03	20.157	-85.292	16:44:03	19.001	-84.727	5238	30.6	141.5	156.43	12564
9	CAR	02	2	16:44:51	18.938	-84.687	17:11:34	16.674	-83.602	9999	26.0	151.2	157.67	12565
10	CAR	02	3	17:11:34	16.674	-83.602	17:38:17	14.376	-82.509	9999	21.2	167.8	158.78	12538
11	CAR	02	4	17:38:18	14.376	-82.509	17:58:35	12.633	-81.726	7595	18.8	187.1	160.72	12513
12	CAR	03	1	18:00:06	12.508	-81.753	18:26:48	10.928	-83.420	9999	18.6	205.8	232.59	12510

NUMBER OF FILES FOR THIS FLIGHT = 12  
 TOTAL NUMBER OF SCAN LINES = 82148  
 DATE THESE FILES WERE PROCESSED = 24-Jun-2003  
 DATE THIS LIST WAS CREATED = Wed Jun 25 13:07:13 PDT 2003  
 GRANULE VERSION = 1

## FLIGHT SUMMARY REPORT

**Flight Number:** 03-003-03

**Calendar/Julian Date:** 10 March 2003 (069)

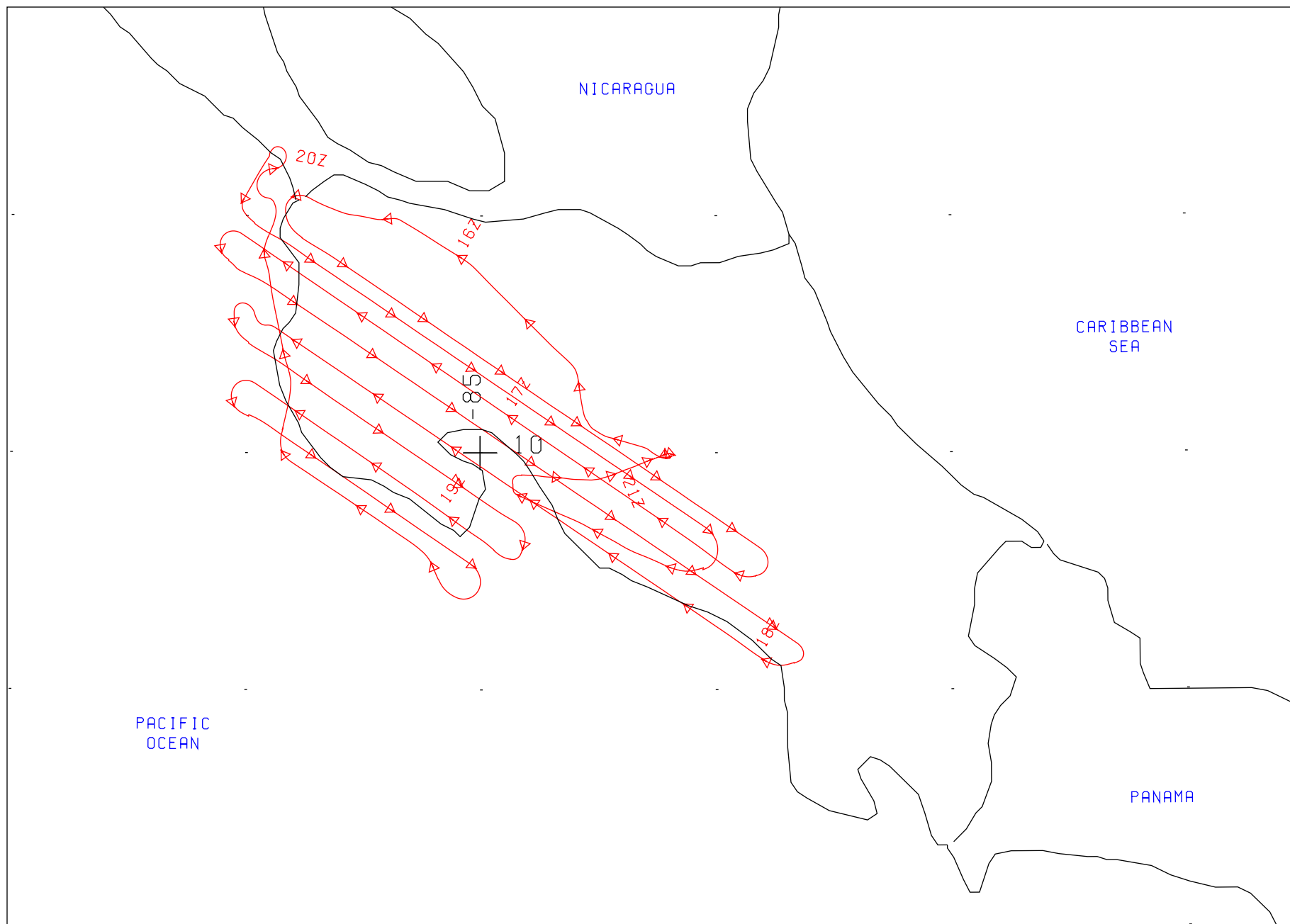
**Sensor Package:** Wild Heerbrugg RC-10  
MODIS/ASTER Airborne Simulator (MASTER)  
Airborne Volcanic Emissions Mass Spectrometer (AVEMS)

**Area(s) Covered:** Costa Rica

**Investigator(s):** Diaz, CENAT      **Aircraft Number:** 926  
NASA JSC WB-57

### SENSOR DATA

<b>Accession #:</b>	05743	-----	-----
<b>Sensor ID #:</b>	076	124	139
<b>Sensor Type:</b>	RC-10	MASTER	AVEMS
<b>Focal Length:</b>	12" 304.89 mm	-----	-----
<b>Film Type:</b>	Aerochrome IR SO-734	-----	-----
<b>Filtration:</b>	Wratten 12	-----	-----
<b>Spectral Band:</b>	510-900 nm	-----	-----
<b>f-Stop:</b>	11	-----	-----
<b>Shutter Speed:</b>	1/350	-----	-----
<b># of Frames:</b>	414	-----	-----
<b>% Overlap:</b>	60	-----	-----
<b>Quality:</b>	Excellent	-----	-----
<b>Remarks:</b>	Subtract 2 seconds for correct UTC		



FLIGHT 03-003-03

10 MARCH 2003

A/C 926

MASTER / RC-10

MODIS/ASTER AIRBORNE SIMULATOR (MASTER) FLIGHT LINE INFORMATION  
 FOR 10 Mar 2003  
 NASA FLIGHT NUMBER 03-003-03

FLTL	SITE	LINE	RUN	START OF FLIGHT LINE			END OF FLIGHT LINE			FLIGHT DATA				
				TIME HH:MM:SS	LAT DEG	LON DEG	TIME HH:MM:SS	LAT DEG	LON DEG	SCAN LINES	SOLAR ZEN	AZIM	HEAD DEG	ALT M (MSL)
1	CRT	14	1	16:12:12	10.933	-85.791	16:41:34	9.600	-83.813	10956	25.3	124.6	129.52	12214
2	CRT	12	1	16:44:55	9.488	-83.907	17:17:46	10.923	-86.017	12259	19.1	139.5	294.95	12201
3	CRT	10	1	17:21:19	10.767	-86.021	17:56:02	9.197	-83.656	12966	15.3	170.8	122.63	12211
4	CRT	08	1	17:59:05	9.106	-83.754	18:30:49	10.528	-85.873	11854	15.4	203.3	290.80	12199
5	CRT	6A	1	18:35:23	10.488	-86.015	18:52:50	9.711	-84.854	6525	19.3	222.2	130.07	12231
6	CRT	4A	1	18:56:33	9.571	-84.920	19:12:09	10.293	-85.959	5835	22.7	232.6	298.65	12262
7	CRT	2A	1	19:15:01	10.168	-86.015	19:29:08	9.532	-85.043	5275	26.3	238.7	121.51	12229
8	CRT	1A	1	19:34:40	9.550	-85.216	19:43:43	9.964	-85.808	3386	29.9	243.6	309.97	12240
9	CRT	13	1	20:05:14	10.993	-85.989	20:33:57	9.678	-84.032	10736	39.8	250.2	138.12	12232

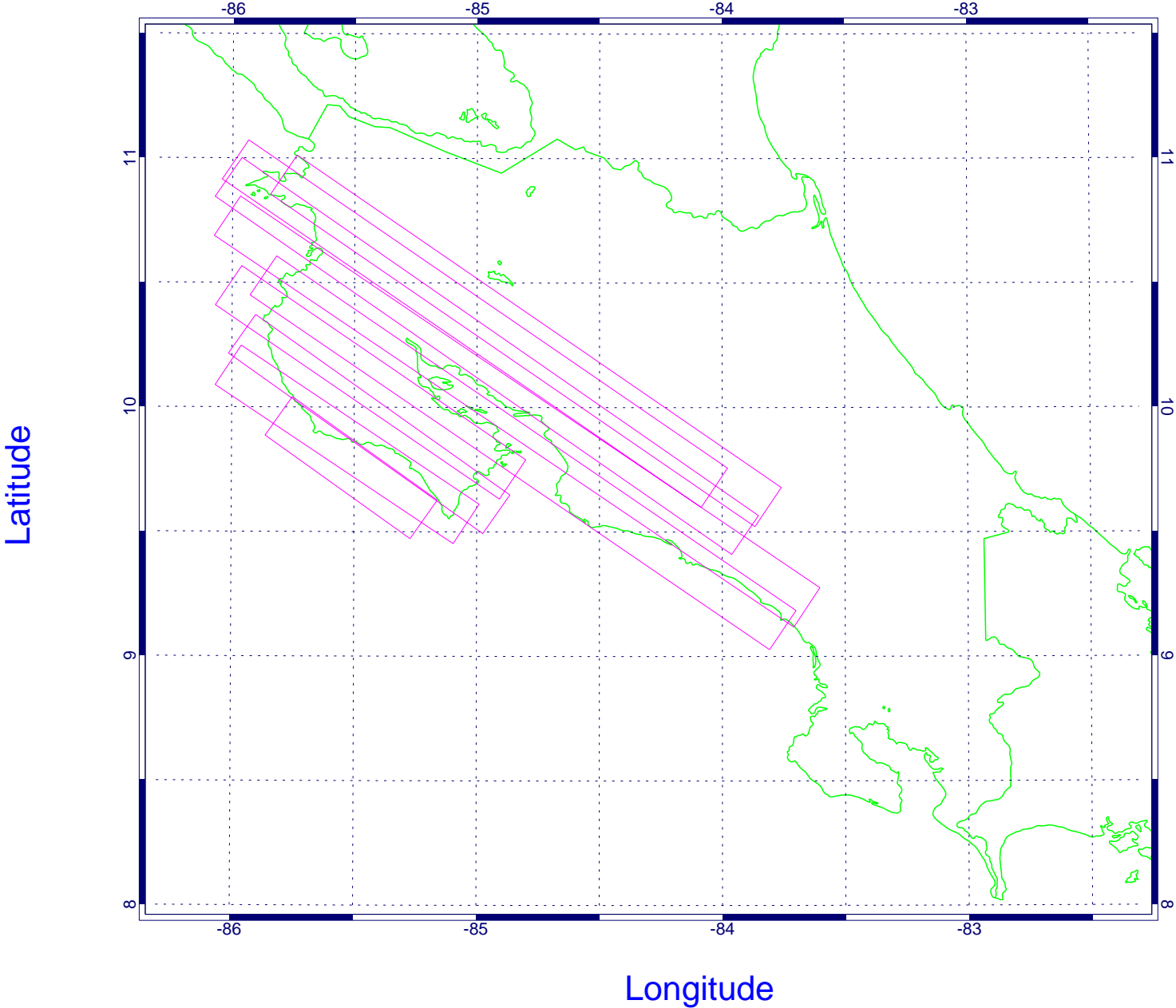
NUMBER OF FILES FOR THIS FLIGHT = 9  
 TOTAL NUMBER OF SCAN LINES = 79792  
 DATE THESE FILES WERE PROCESSED = 04-Jun-2003  
 DATE THIS LIST WAS CREATED = Wed Jun 4 11:49:42 PDT 2003  
 GRANULE VERSION = 1

**Data Quality Notice:**

MASTER mid-wave infrared and long-wave infrared image data exhibits a cross-track signal contamination. This makes the calibration of bands 25-50 (3.14 um - 12.94 um) suspect. Hence bands 26-50 are set to fill value of -9999 in the archived data.



MASTER AIRBORNE SIMULATOR 10 Mar 2003, 03-003-03, 9 FLIGHT LINES



# CAMERA FLIGHT LINE DATA

## FLIGHT NO. 03-003-03

Accession # 05743

Sensor # 076

Site #	Line #	Run #	Frame #	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
				START	END		
CRT	14	1	3840-3897	16:12:22	16:39:58	40000/12200	10-70% cumulus, frames 3861-3877; 10% cumulus, frames 3877 and 3881-3882; 10-50% cumulus, frames 3887-3897
CRT	12	1	3898-3957	16:49:24	17:17:46	39900/12170	10-30% cumulus, frames 3898-3904
CRT	10	1	3958-3997	17:25:02	17:43:41	40000/12200	10-30% smoke, frames 3974-3976; 20-50% cumulus, frames 3996-3997
CRT	8	1	3998-4064	18:00:34	18:31:57	40000/12200	Minor-20% cumulus, frames 4015-4024; 10-30% smoke, frames 4044-4046; frames 4063-4064 oblique
CRT	6A	1	4065-4106	18:36:07	18:55:35	40100/12230	Minor smoke, frames 4068-4069; 10-20% smoke, frames 4082-4085; frames 4105-4106 oblique
CRT	4A	1	4107-4141	18:56:04	19:11:54	40100/12230	Minor-10% smoke, frames 4124-4127
CRT	2A	1	4142-4169	19:16:42	19:29:30	40100/12230	Clear, frame 4169 oblique
CRT	1A	1	4170-4192	19:39:58	19:49:58	40100/12230	Clear
CRT	13	1	4193-4253	20:05:35	20:33:31	40100/12230	Minor-10% cumulus, frames 4230-4235, 4245-4247 and 4250-4253



RC-10

A/C 926(JSC WB-57)

10 MARCH 2003

FLIGHT 03-003-03





RC-10

A/C 926(JSC WB-57)

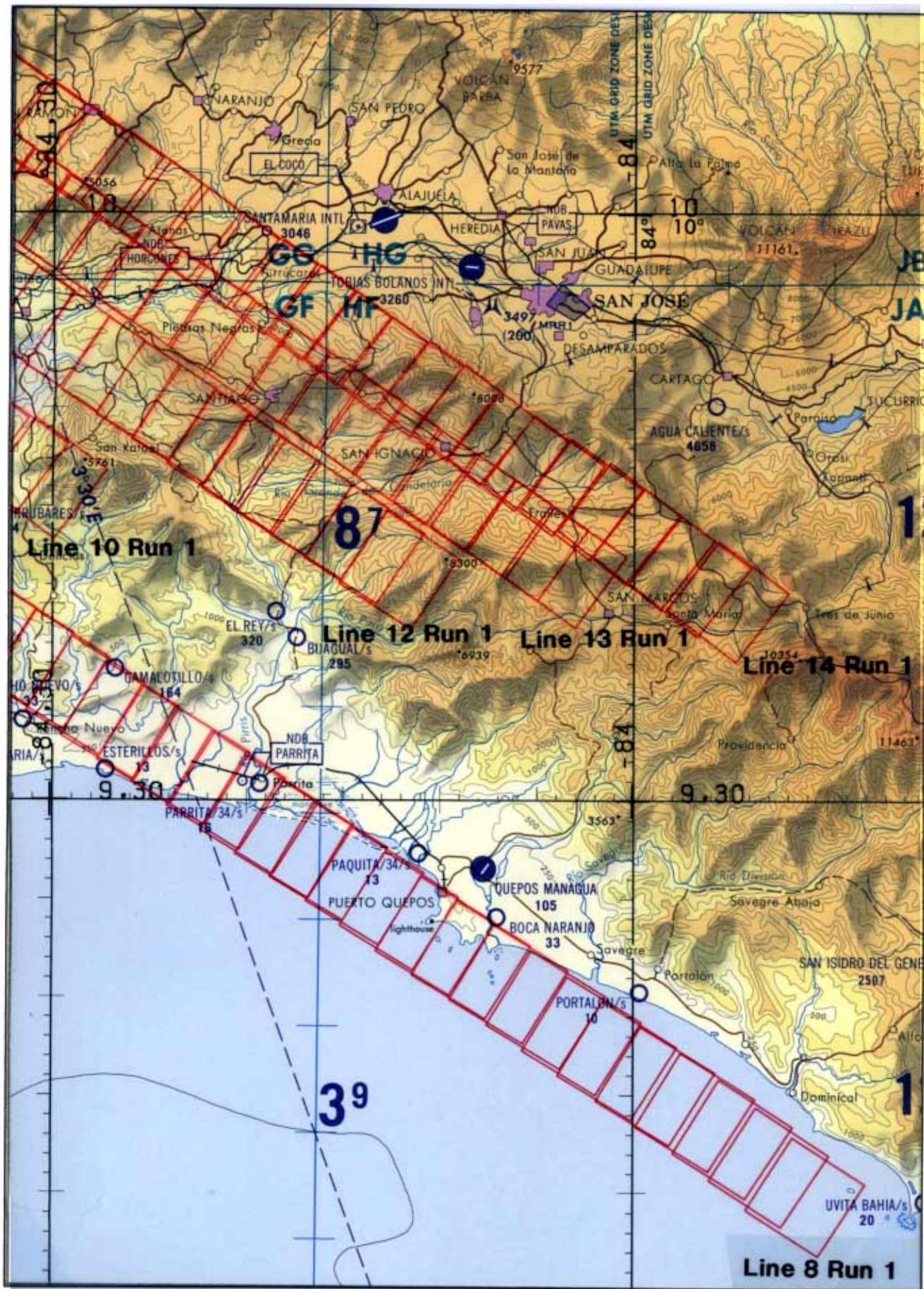
10 MARCH 2003

FLIGHT 03-003-03









RC-10

A/C 926(JSC WB-57)

10 MARCH 2003

FLIGHT 03-003-03

## FLIGHT SUMMARY REPORT

**Flight Number:** 03-003-04

**Calendar/Julian Date:** 11 March 2003 (070)

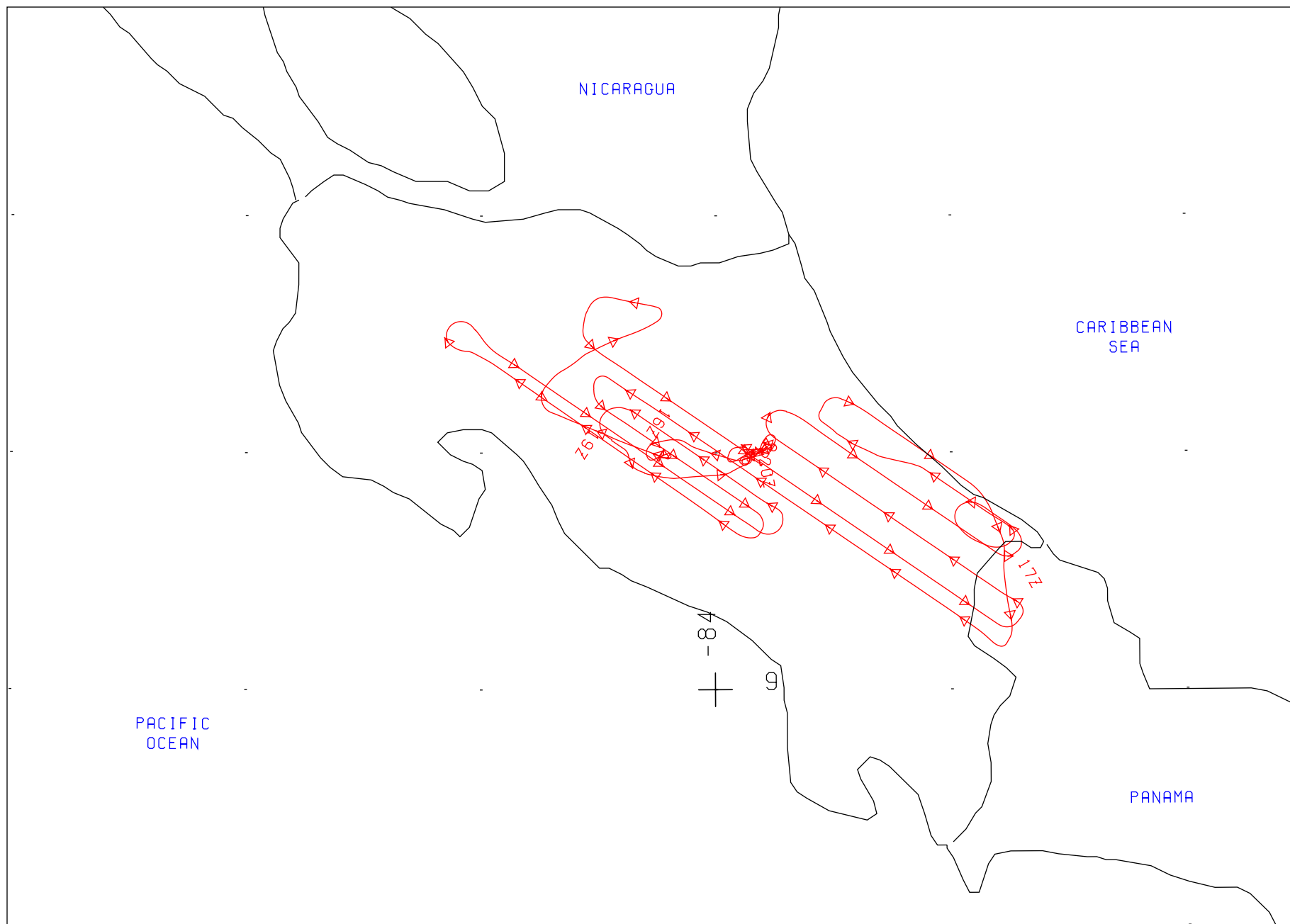
**Sensor Package:** Wild Heerbrugg RC-10  
MODIS/ASTER Airborne Simulator (MASTER)  
Airborne Volcanic Emissions Mass Spectrometer (AVEMS)

**Area(s) Covered:** Costa Rica

**Investigator(s):** Diaz, CENAT      **Aircraft Number:** 926  
NASA JSC WB-57

### SENSOR DATA

<b>Accession #:</b>	05744	05745	-----	-----
<b>Sensor ID #:</b>	076	034	124	139
<b>Sensor Type:</b>	RC-10	RC-10	MASTER	AVEMS
<b>Focal Length:</b>	12" 304.89 mm	12" 304.66 mm	-----	-----
<b>Film Type:</b>	Aerochrome IR SO-734	Aerochrome IR SO-734	-----	-----
<b>Filtration:</b>	Wratten 12	Wratten 12	-----	-----
<b>Spectral Band:</b>	510-900 nm	510-900 nm	-----	-----
<b>f-Stop:</b>	11	11	-----	-----
<b>Shutter Speed:</b>	1/350	1/350	-----	-----
<b># of Frames:</b>	157	35	-----	-----
<b>% Overlap:</b>	60	60	-----	-----
<b>Quality:</b>	Excellent	Excellent	-----	-----
<b>Remarks:</b>	Subtract 1 second for correct UTC	Subtract 1 second for correct UTC		



FLIGHT 03-003-04

11 MARCH 2003

A/C 926

MASTER / DUAL RC-10

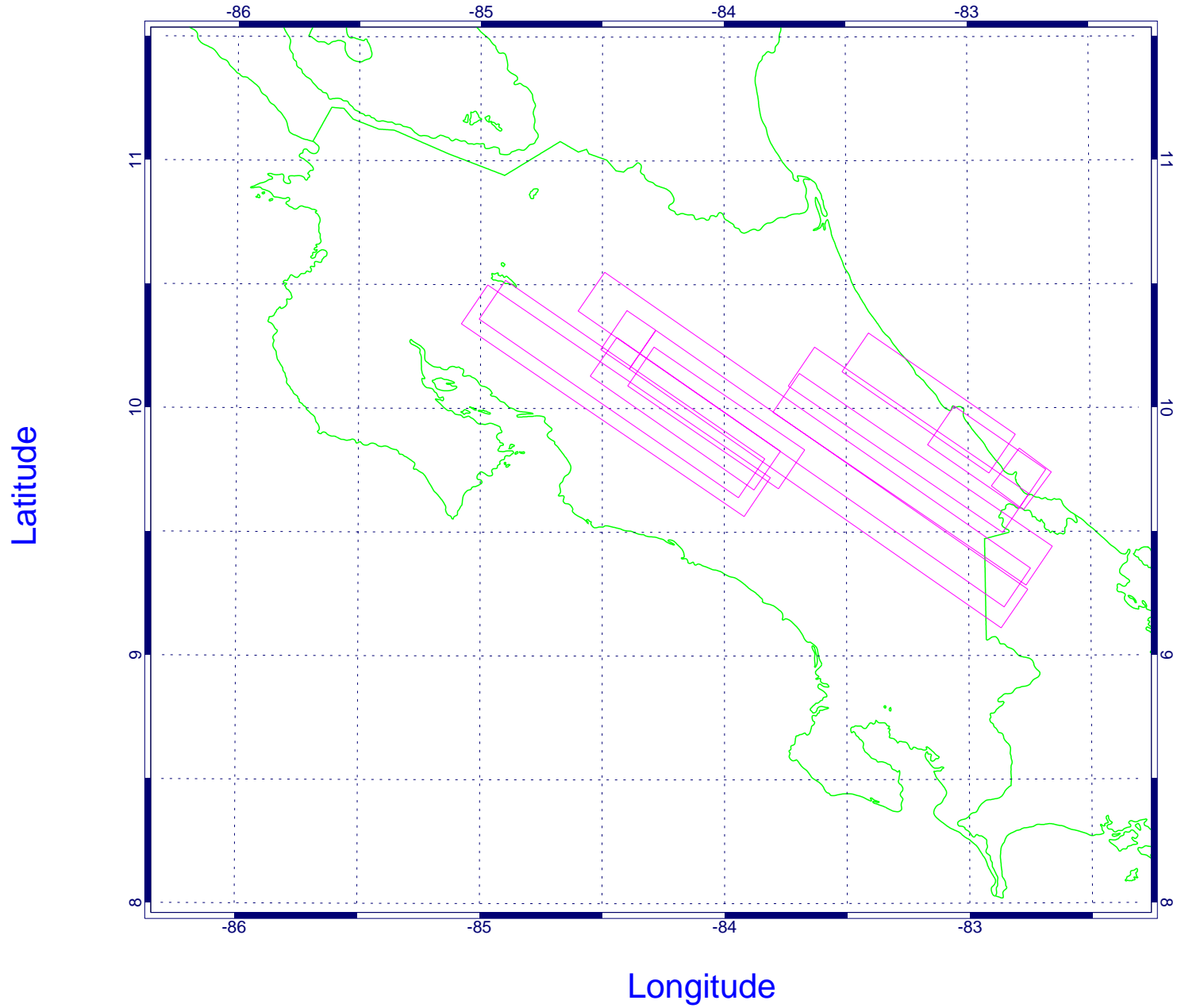


MODIS/ASTER AIRBORNE SIMULATOR (MASTER) FLIGHT LINE INFORMATION  
 FOR 11 Mar 2003  
 NASA FLIGHT NUMBER 03-003-04

FLTL	SITE	LINE	RUN	START OF FLIGHT LINE			END OF FLIGHT LINE			FLIGHT DATA				
				TIME HH:MM:SS	LAT DEG	LON DEG	TIME HH:MM:SS	LAT DEG	LON DEG	SCAN LINES	SOLAR ZEN	AZIM	HEAD DEG	ALT M (MSL)
1	CRT	19	1	15:54:37	10.472	-84.545	16:21:57	9.274	-82.801	10197	27.8	118.7	129.87	12204
2	CRT	21	1	16:24:42	9.362	-82.711	16:43:25	10.063	-83.746	6979	22.0	127.3	302.42	12206
3	CRT	23	1	16:45:58	10.169	-83.683	16:59:04	9.575	-82.806	4896	18.7	136.7	116.03	12230
4	CRT	25	1	17:01:42	9.664	-82.717	17:03:53	9.761	-82.848	818	16.6	143.8	308.16	12232
5	CRT	25	2	17:09:44	9.673	-82.737	17:15:21	9.930	-83.112	2102	15.4	151.0	307.45	12220
6	CRT	26	1	17:24:11	10.226	-83.462	17:32:51	9.815	-82.861	3235	14.3	165.2	130.96	12208
7	CRT	18	1	17:42:15	9.189	-82.813	18:09:00	10.238	-84.335	9999	13.9	190.7	304.09	12171
8	CRT	18	2	18:09:00	10.238	-84.335	18:11:26	10.317	-84.453	912	15.0	201.7	301.30	12172
9	CRT	16	1	18:14:15	10.209	-84.495	18:25:13	9.749	-83.824	4100	16.0	210.8	132.11	12189
10	CRT	14	2	18:27:43	9.642	-83.865	18:47:41	10.420	-85.025	7463	18.5	222.1	290.41	12234
11	CRT	15	1	18:52:50	10.439	-84.952	19:10:03	9.718	-83.888	6442	22.9	233.4	128.27	12172
12	CRT	17	1	19:13:40	9.754	-83.724	19:24:15	10.170	-84.342	3961	26.7	240.4	303.14	12204

NUMBER OF FILES FOR THIS FLIGHT = 12  
 TOTAL NUMBER OF SCAN LINES = 61104  
 DATE THESE FILES WERE PROCESSED = 12-Jun-2003  
 DATE THIS LIST WAS CREATED = Thu Jun 12 12:39:42 PDT 2003  
 GRANULE VERSION = 1

MASTER AIRBORNE SIMULATOR 11 Mar 2003, 03-003-04, 12 FLIGHT LINES



# CAMERA FLIGHT LINE DATA

## FLIGHT NO. 03-003-04

Accession # 05744

Sensor # 076

Site #	Line #	Run #	Frame #	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
				START	END		
CRT	19	1	4265-4317	15:55:48	16:20:57	40000/12200	10-50% cumulus, frames 4265-4274; 10-80% cumulus, frames 4279-4285; minor-10% cumulus, frames 4293-4296, 4300-4302 and 4309-4317
CRT	21	1	4318-4355	16:25:10	16:42:59	40100/12230	Minor-10% cumulus, frames 4318-4325 and 4332-4334; minor-30% cumulus, frames 4338-4351; minor-20% cumulus, frames 4353-4355
CRT	23	1	4356-4369	16:52:19	16:58:31	40100/12230	10-70% cumulus, frames 4356-4362; minor-10% cumulus, frames 4364-4369
CRT	25	1	4370-4373	17:02:33	17:03:59	40100/12230	10-50% stratus; frames 4373 oblique
CRT	25	2	4374-4384	17:10:26	17:15:12	40200/12260	10-30% cumulus, frames 4374-4378; minor-30% cumulus, frames 4380-4384
CRT	26	1	4385-4400	17:24:55	17:31:39	40100/12230	10-80% stratus and cumulus
CRT	18	1	4401-4421	17:43:29	17:52:34	40100/12230	10-30% cumulus, frames 4403-4415

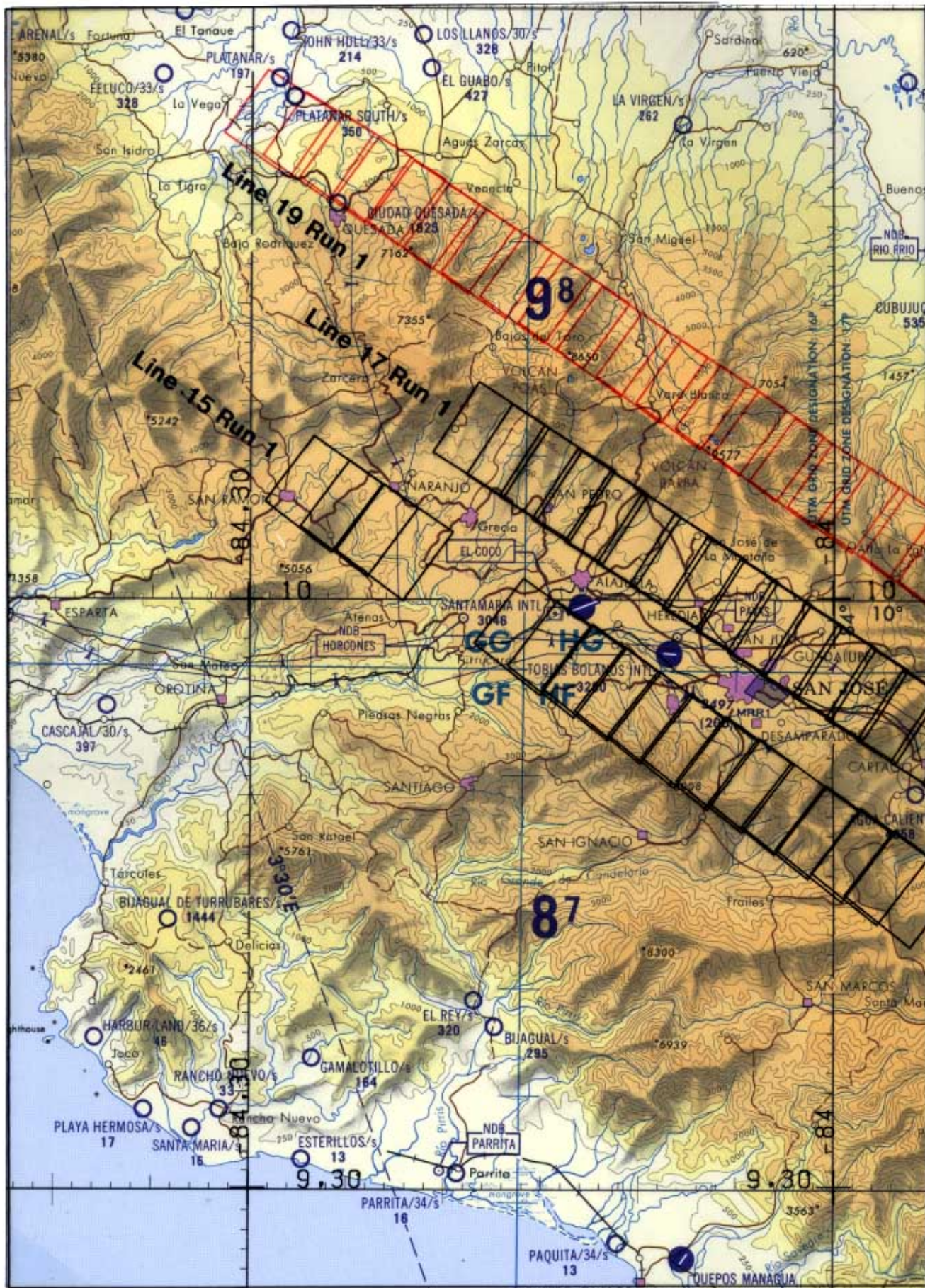
**CAMERA FLIGHT LINE DATA**  
**FLIGHT NO. 03-003-04**

**Accession #** 05745

**Sensor #** 034

Site #	Line #	Run #	Frame #	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
				START	END		
CRT	15	1	7764-7778	19:01:04	19:09:08	39900/12170	Minor cumulus, frames 7771-7772; 10-30% cumulus, frames 7776-7778
CRT	17	1	7779-7798	19:14:43	19:23:22	40100/12230	10-80% cumulus, frames 7779-7789; 10% cumulus, frames 7795-7796 and 7798





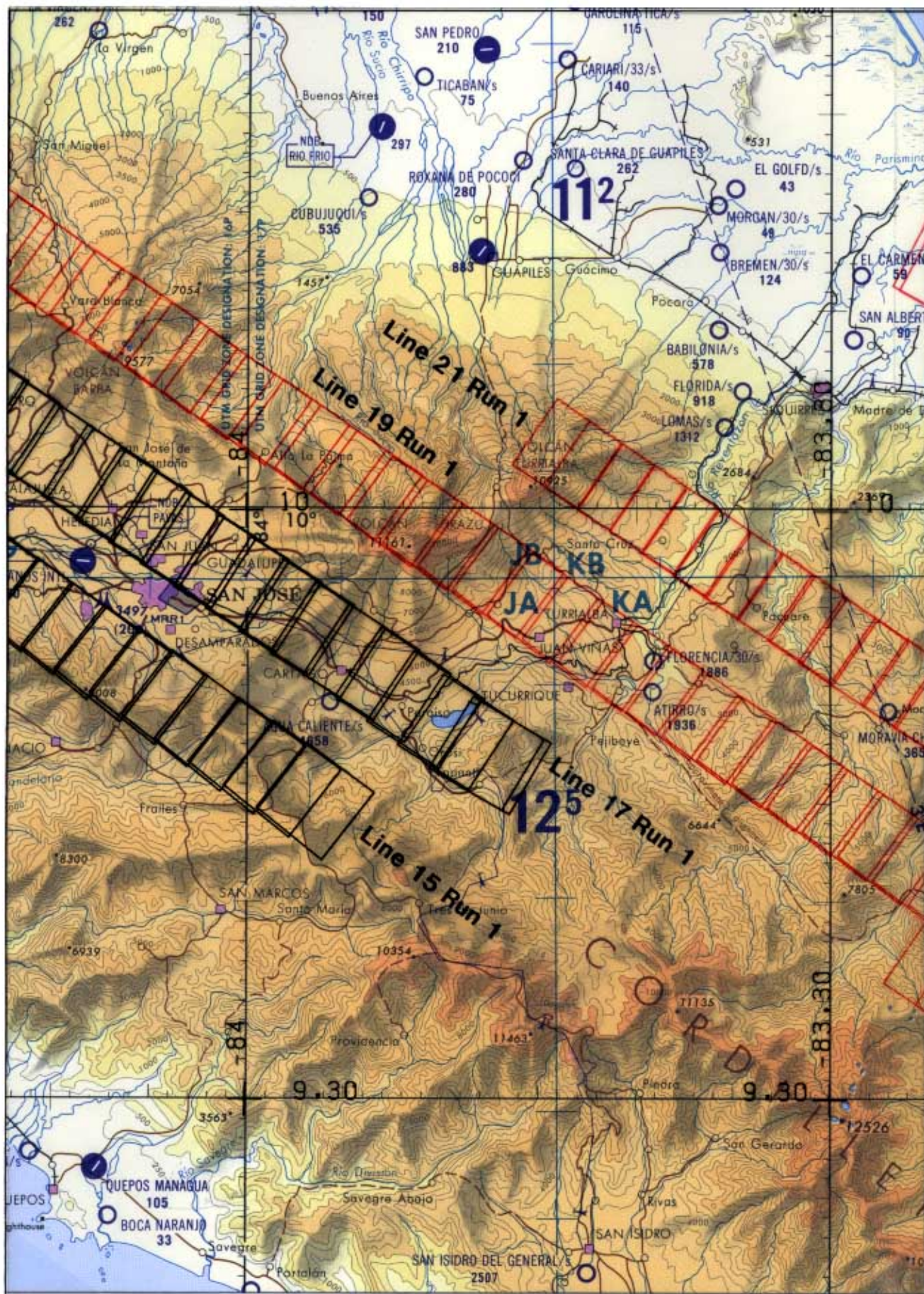
RC-10

R/C 926(JSC WB-57)

11 MARCH 2003

FLIGHT 03-003-04





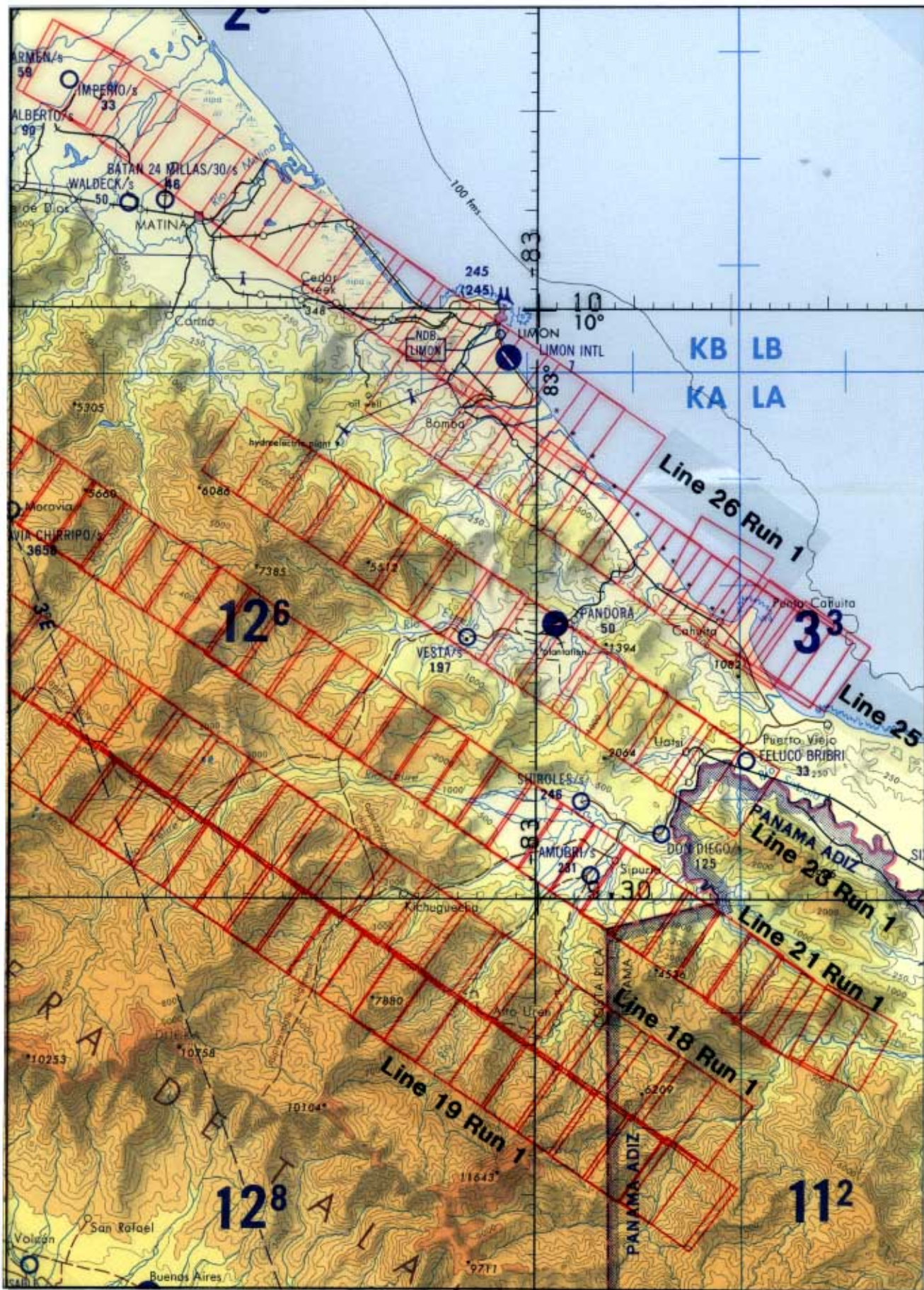
RC-10

R/C 926 (JSC WB-57)

11 MARCH 2003

FLIGHT 03-003-04





RC-10

A/C 926(JSC WB-S7)

11 MARCH 2003

FLIGHT 03-003-04

## FLIGHT SUMMARY REPORT

**Flight Number:** 03-003-05

**Calendar/Julian Date:** 12 March 2003 (071)

**Sensor Package:** Wild Heerbrugg RC-10  
MODIS/ASTER Airborne Simulator (MASTER)  
Airborne Volcanic Emissions Mass Spectrometer (AVEMS)

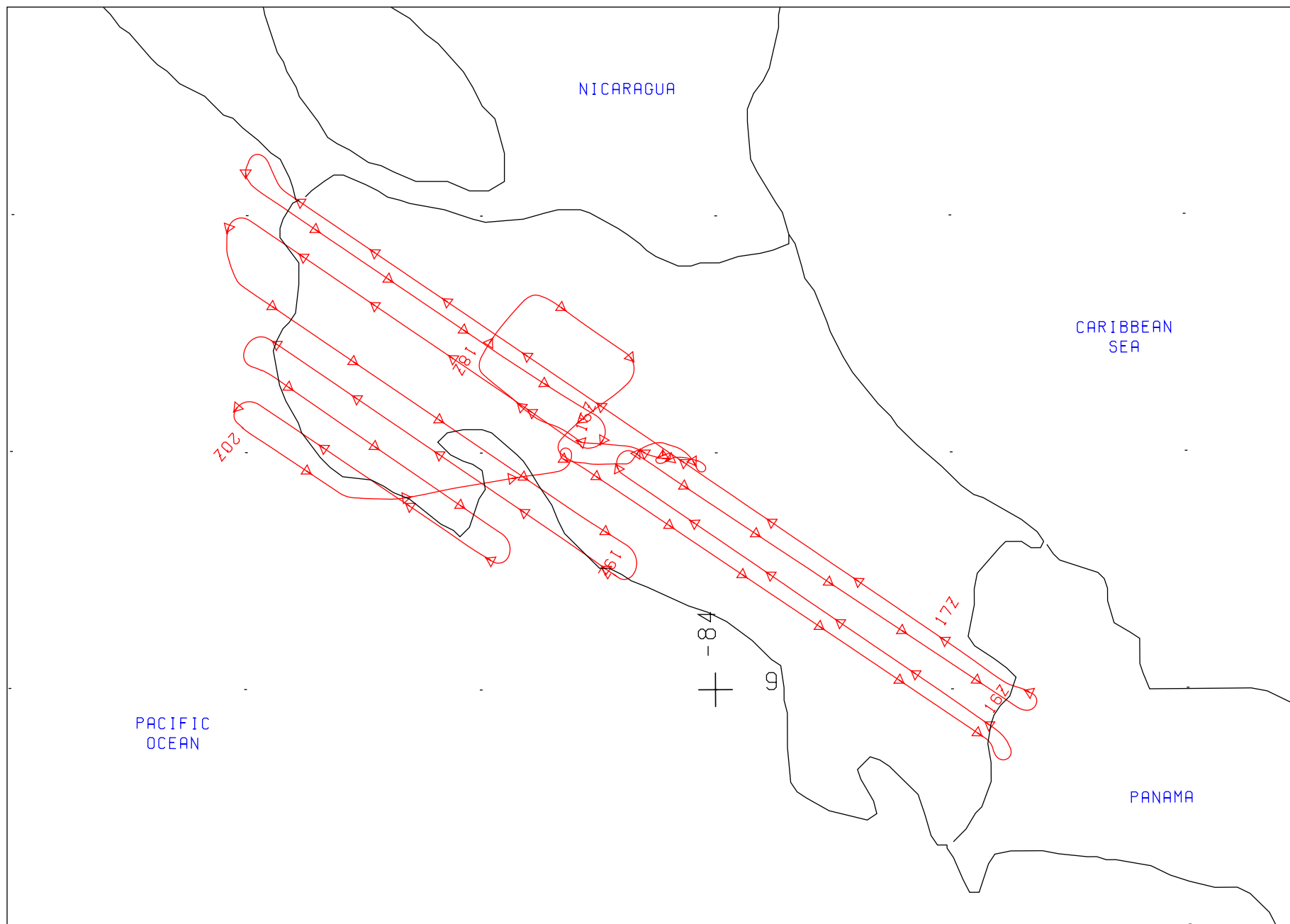
**Area(s) Covered:** Costa Rica

**Investigator(s):** Diaz, CENAT      **Aircraft Number:** 926  
NASA JSC WB-57

### SENSOR DATA

<b>Accession #:</b>	05746	05747	-----	-----
<b>Sensor ID #:</b>	076	034	124	139
<b>Sensor Type:</b>	RC-10	RC-10	MASTER	AVEMS
<b>Focal Length:</b>	12" 304.89 mm	12" 304.66 mm	-----	-----
<b>Film Type:</b>	Aerochrome IR SO-734	Aerochrome IR SO-734	-----	-----
<b>Filtration:</b>	Wratten 12	Wratten 12	-----	-----
<b>Spectral Band:</b>	510-900 nm	510-900 nm	-----	-----
<b>f-Stop:</b>	11	11	-----	-----
<b>Shutter Speed:</b>	1/350	1/350	-----	-----
<b># of Frames:</b>	459	19	-----	-----
<b>% Overlap:</b>	60	60	-----	-----
<b>Quality:</b>	Excellent	Excellent	-----	-----
<b>Remarks:</b>	Subtract 1 second for correct UTC	No offset to UTC		





FLIGHT 03-003-05

12 MARCH 2003

A/C 926

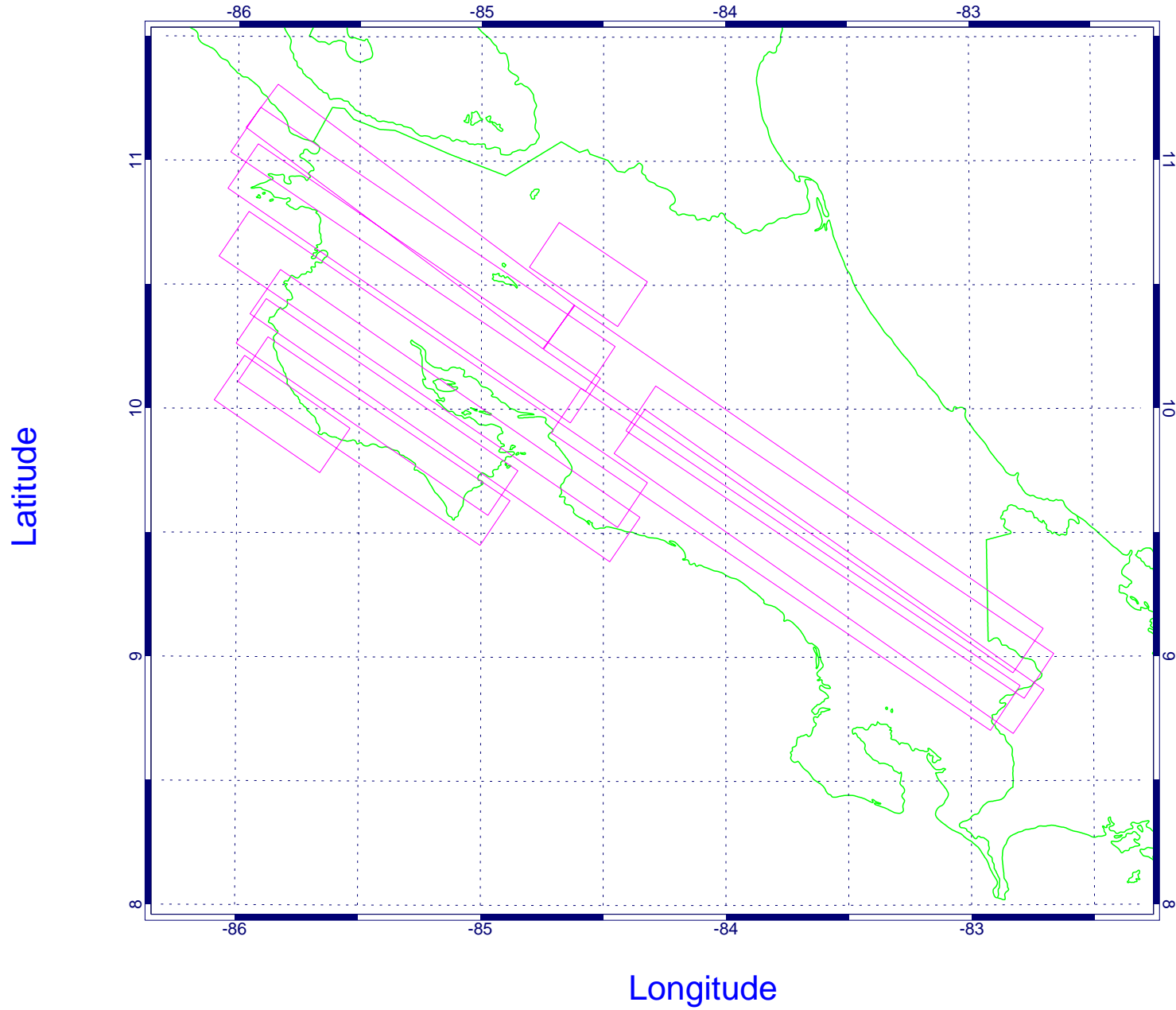
MASTER / DUAL RC-10

MODIS/ASTER AIRBORNE SIMULATOR (MASTER) FLIGHT LINE INFORMATION  
 FOR 12 Mar 2003  
 NASA FLIGHT NUMBER 03-003-05

FLTL	SITE	LINE	RUN	START OF FLIGHT LINE			END OF FLIGHT LINE			FLIGHT DATA				
				TIME HH:MM:SS	LAT DEG	LON DEG	TIME HH:MM:SS	LAT DEG	LON DEG	SCAN LINES	SOLAR ZEN	AZIM	HEAD DEG	ALT M (MSL)
1	CRT	20	1	15:13:40	10.663	-84.743	15:19:31	10.424	-84.381	2181	40.3	108.2	118.38	13785
2	CRT	12	2	15:27:33	9.995	-84.653	15:55:15	8.793	-82.860	10332	33.4	111.3	123.19	13783
3	CRT	13	2	15:58:23	8.779	-82.765	16:24:19	9.911	-84.393	9683	26.5	117.9	312.63	13712
4	CRT	15	2	16:26:17	10.004	-84.347	16:52:28	8.922	-82.722	9783	20.8	128.6	125.37	13789
5	CRT	16	2	16:55:58	9.024	-82.766	17:22:42	10.331	-84.683	9999	16.0	145.6	301.42	13789
6	CRT	16	3	17:22:42	10.331	-84.683	17:42:13	11.220	-85.903	7301	15.0	161.3	318.10	13786
7	CRT	15	3	17:45:17	11.124	-85.970	18:07:34	10.163	-84.513	8336	14.5	185.5	125.37	13787
8	CRT	13	2	18:11:01	10.035	-84.574	18:32:48	10.977	-85.980	8153	15.9	208.7	294.91	13812
9	CRT	09	1	18:37:25	10.704	-86.016	19:00:26	9.614	-84.381	8616	19.9	226.7	124.22	13791
10	CRT	7A	1	19:03:19	9.475	-84.412	19:24:24	10.471	-85.887	7894	24.6	238.2	301.59	13816
11	CRT	5A	1	19:27:26	10.353	-85.944	19:41:29	9.662	-84.911	5263	28.8	243.6	119.71	13839
12	CRT	3A	1	19:43:52	9.541	-84.943	19:57:39	10.199	-85.936	5161	32.4	247.4	299.88	13824
13	CRT	1A	2	19:59:52	10.124	-86.032	20:05:45	9.832	-85.599	2205	34.8	249.2	129.77	13828

NUMBER OF FILES FOR THIS FLIGHT = 13  
 TOTAL NUMBER OF SCAN LINES = 94907  
 DATE THESE FILES WERE PROCESSED = 10-Jun-2003  
 DATE THIS LIST WAS CREATED = Tue Jul 8 10:56:28 PDT 2003  
 GRANULE VERSION = 1

MASTER AIRBORNE SIMULATOR 12 Mar 2003, 03-003-05, 13 FLIGHT LINES



# CAMERA FLIGHT LINE DATA

## FLIGHT NO. 03-003-05

Accession # 05746

Sensor # 076

Site #	Line #	Run #	Frame #	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
				START	END		
CRT	20	1	4428-4435	15:16:35	15:19:30	45200/13780	10-30% cumulus
CRT	12	2	4436-4488	15:33:52	15:55:29	45200/13780	Minor-10% cumulus, frames 4447-4458, 4461-4473; frame 4488 oblique
CRT	13	2	4489-4547	16:00:14	16:24:12	45000/13720	Minor-10% cumulus, frames 4507-4518; minor-30% cumulus, frames 4520-4533
CRT	15	2	4548-4590	16:35:55	16:52:46	45200/13780	Minor-40% cumulus, frames 4548-4559; 10-30% cumulus, frames 4562-4566; minor-10% cumulus, frames 4568-4571 and 4573-4577; minor-40% cumulus, frames 4578-4590; frame 4590 oblique
CRT	16	3	4591-4635	17:24:43	17:42:11	45200/13780	Minor-60% cumulus, frames 4591-4605; minor-20% cumulus, frames 4608-4618; minor-30% cumulus, frames 4628-4635; frames 4631-4632 oblique
CRT	15	3	4636-4671	17:46:46	18:00:35	45200/13780	Minor-10% cumulus, frames 4663-4666 and 4670-4671
CRT	13	2	4672-4725	18:11:44	18:32:47	45300/13810	Minor cumulus, frames 4678-4679
CRT	9	1	4726-4772	18:39:14	18:57:26	45400/13840	10-30% cumulus, frames 4771-4772
CRT	7A	1	4773-4832	19:03:36	19:26:57	45300/13810	10-40% cumulus, frames 4776-4783; frames 4827-4832 oblique
CRT	5A	1	4833-4865	19:28:36	19:41:10	45400/13840	Minor cumulus, frames 4841-4843 and 4846-4850; 10% cumulus; frames 4857-4859
CRT	3A	1	4866-4886	19:44:14	19:51:57	45500/13870	10% cumulus, frames 4874-4876 and 4884-4886

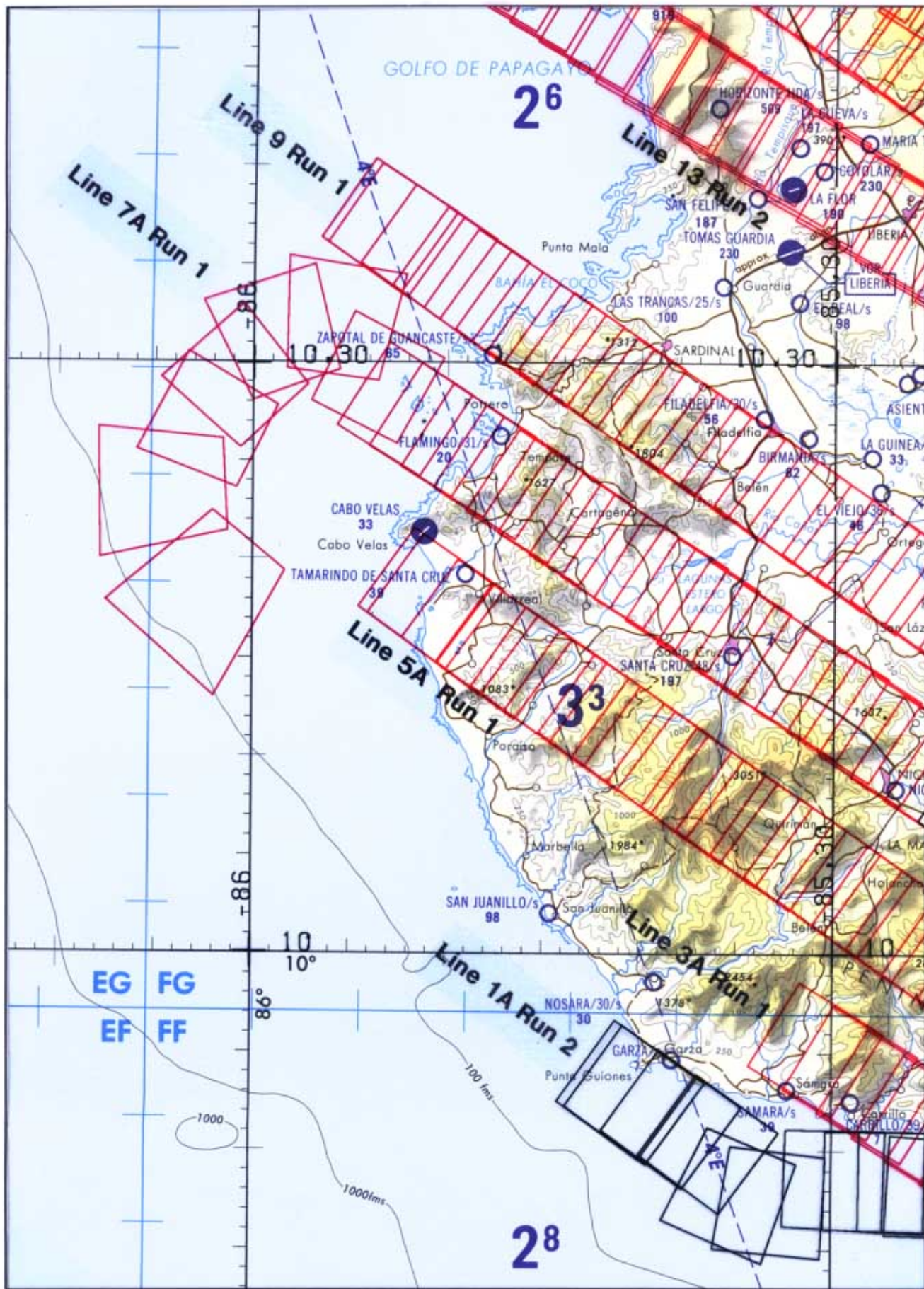
# CAMERA FLIGHT LINE DATA

## FLIGHT NO. 03-003-05

Accession # 05747

Sensor # 034

Site #	Line #	Run #	Frame #	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
				START	END		
CRT	7A	1	7813-7821	19:13:39	19:16:53	45200/13780	Clear
CRT	1A	2	7822-7825	20:04:44	20:05:38	45500/13870	Clear
CRT	-	-	7826-7831	20:06:02	20:08:03	45100/13750	Clear; frames 7826-7827 oblique



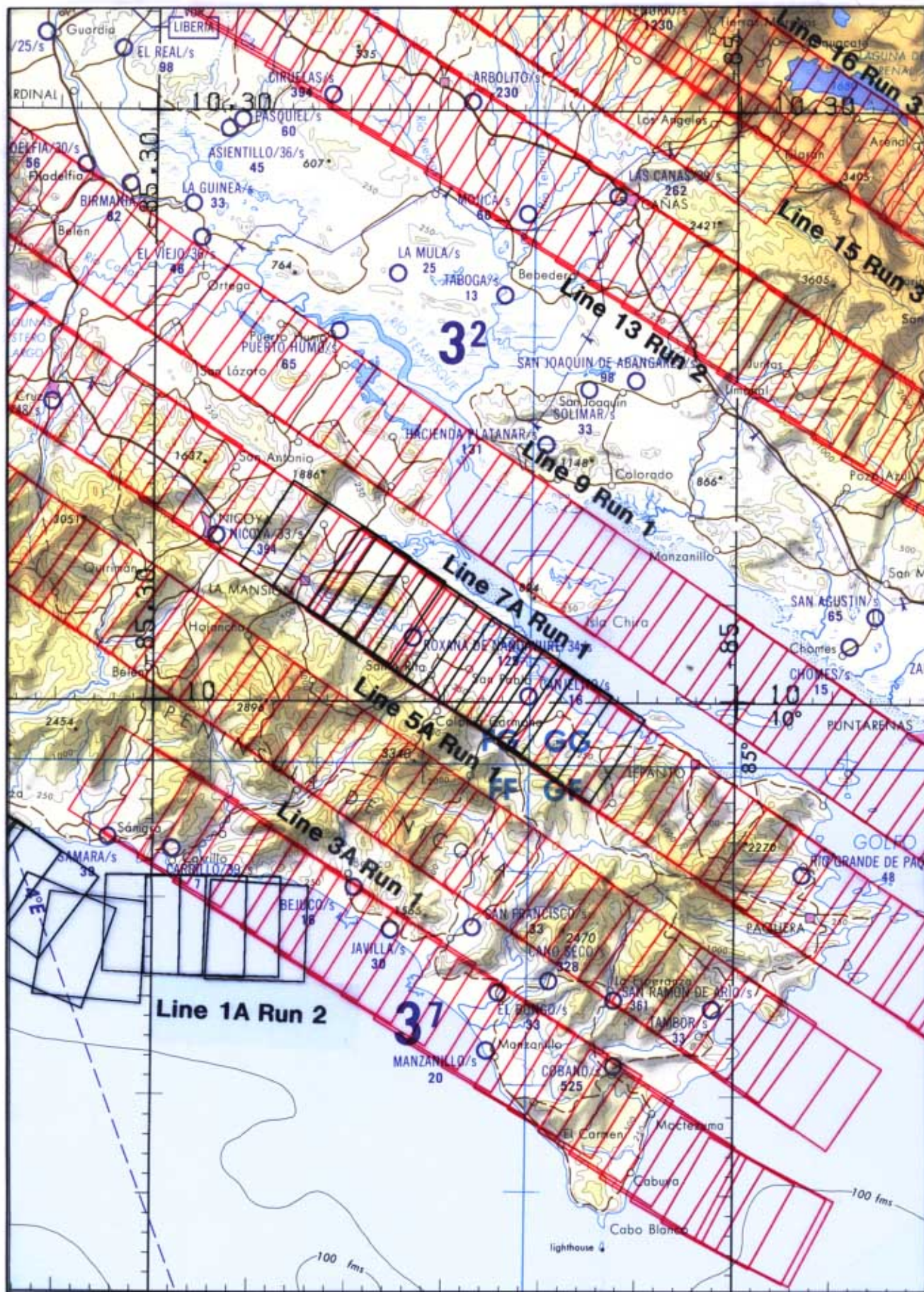
RC-10

A/C 926 (JSC WB-57)

12 MARCH 2003

FLIGHT 03-003-05





RC-10

A/C 926(JSC WB-57)

12 MARCH 2003

FLIGHT 03-003-05

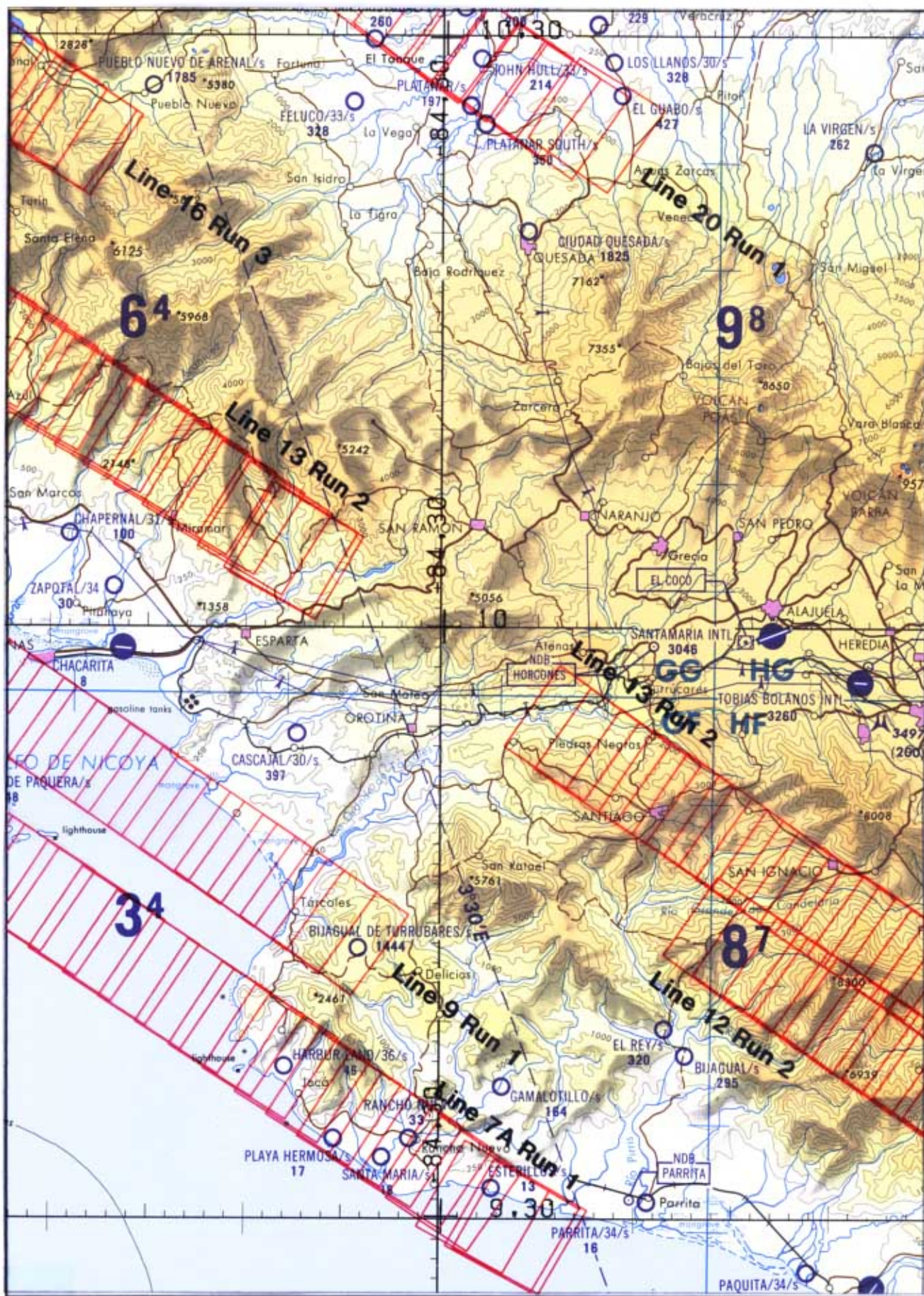












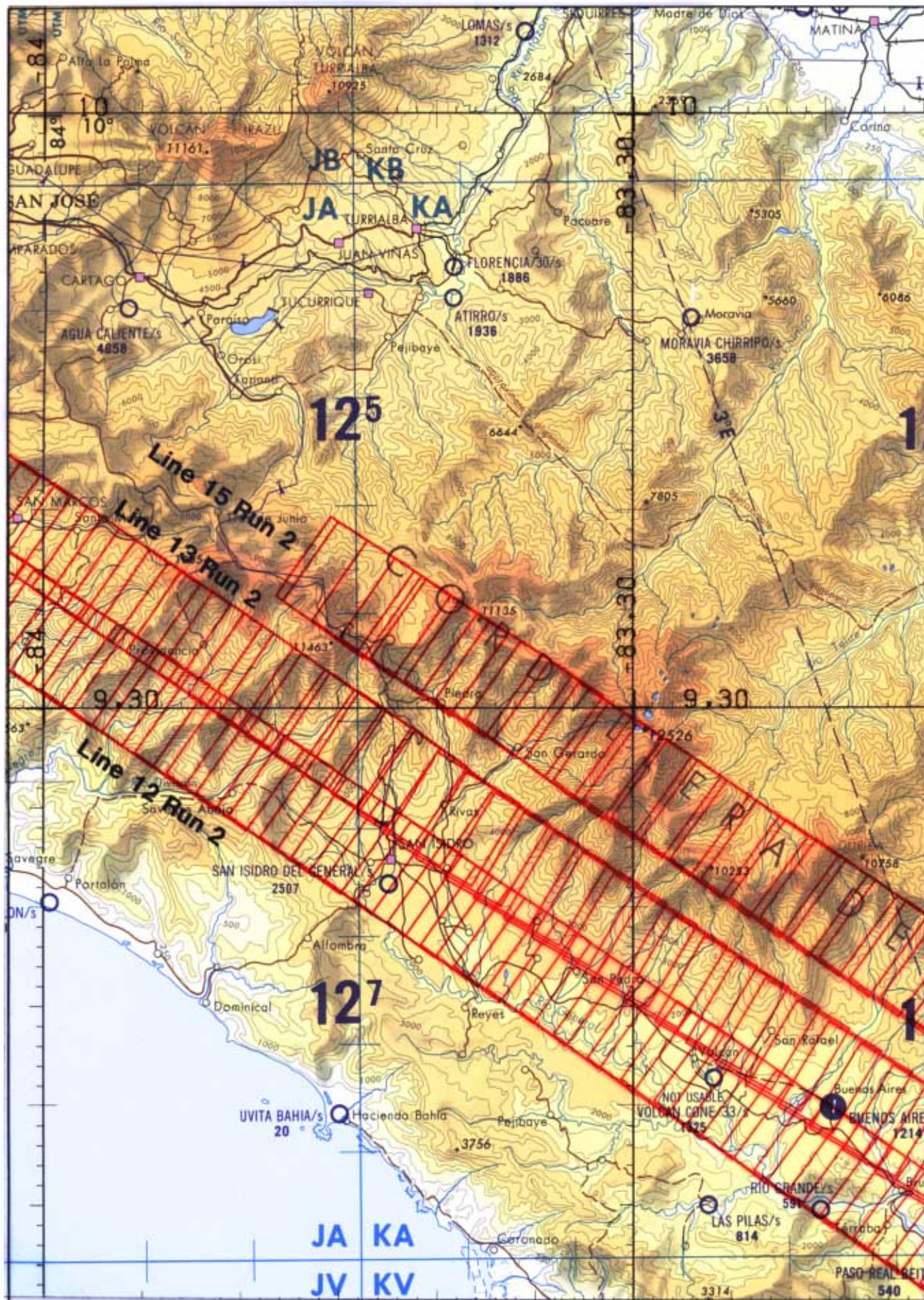
RC-10

A/C 926 (JSC WB-57)

12 MARCH 2003

FLIGHT 03-003-05





RC-10

A/C 926(JSC WB-57)

12 MARCH 2003

FLIGHT 03-003-05







## FLIGHT SUMMARY REPORT

**Flight Number:** 03-003-06

**Calendar/Julian Date:** 13 March 2003 (072)

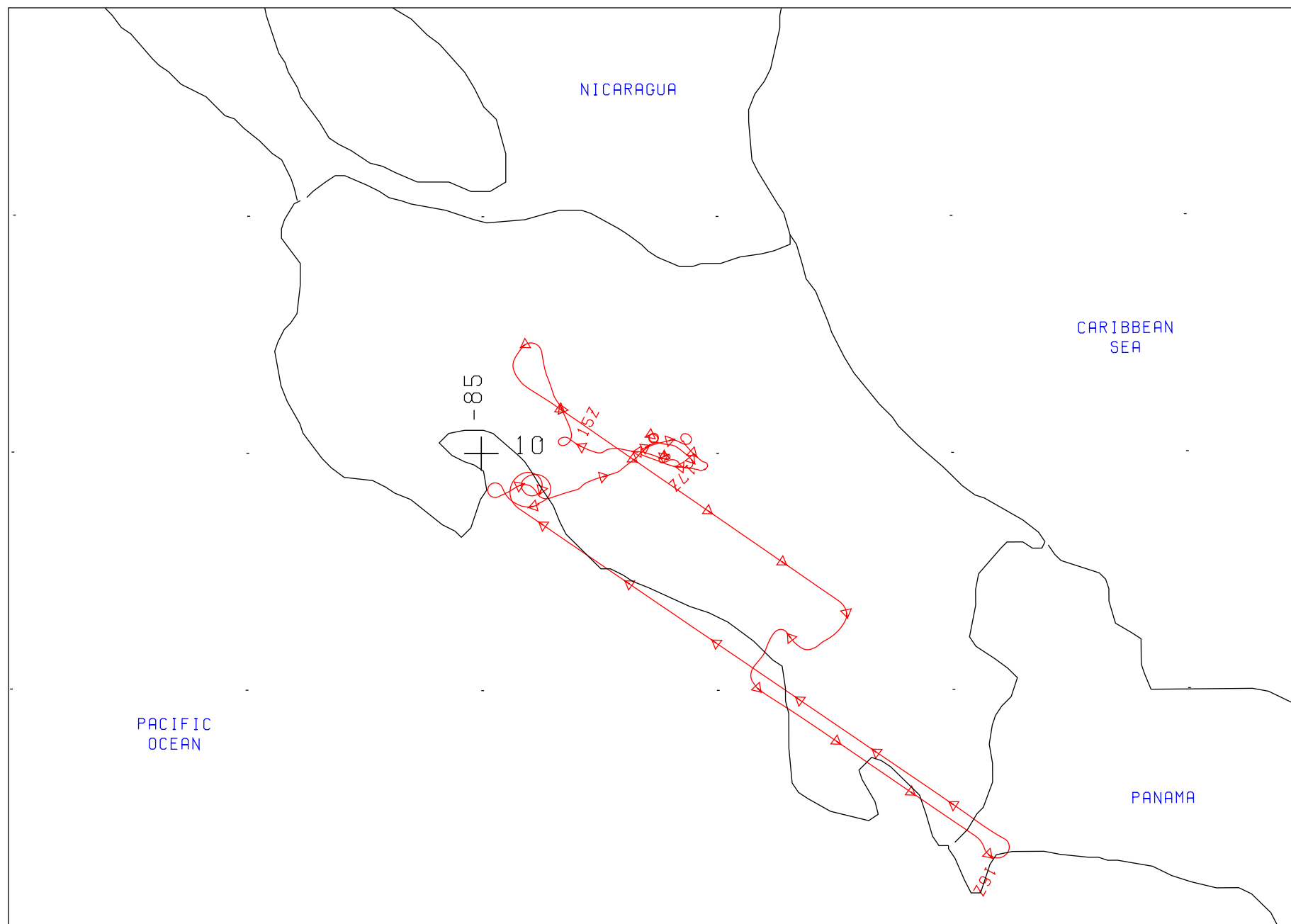
**Sensor Package:** Wild Heerbrugg RC-10  
MODIS/ASTER Airborne Simulator (MASTER)  
Airborne Volcanic Emissions Mass Spectrometer (AVEMS)

**Area(s) Covered:** Costa Rica

**Investigator(s):** Diaz, CENAT      **Aircraft Number:** 926  
NASA JSC WB-57

### SENSOR DATA

<b>Accession #:</b>	05748	-----	-----
<b>Sensor ID #:</b>	076	124	139
<b>Sensor Type:</b>	RC-10	MASTER	AVEMS
<b>Focal Length:</b>	12" 304.89 mm	-----	-----
<b>Film Type:</b>	Aerochrome IR SO-734	-----	-----
<b>Filtration:</b>	Wratten 12	-----	-----
<b>Spectral Band:</b>	510-900 nm	-----	-----
<b>f-Stop:</b>	11	-----	-----
<b>Shutter Speed:</b>	1/350	-----	-----
<b># of Frames:</b>	119	-----	-----
<b>% Overlap:</b>	60	-----	-----
<b>Quality:</b>	Excellent	-----	-----
<b>Remarks:</b>	Subtract 2 seconds for correct UTC		



FLIGHT 03-003-06

13 MARCH 2003

A/C 926

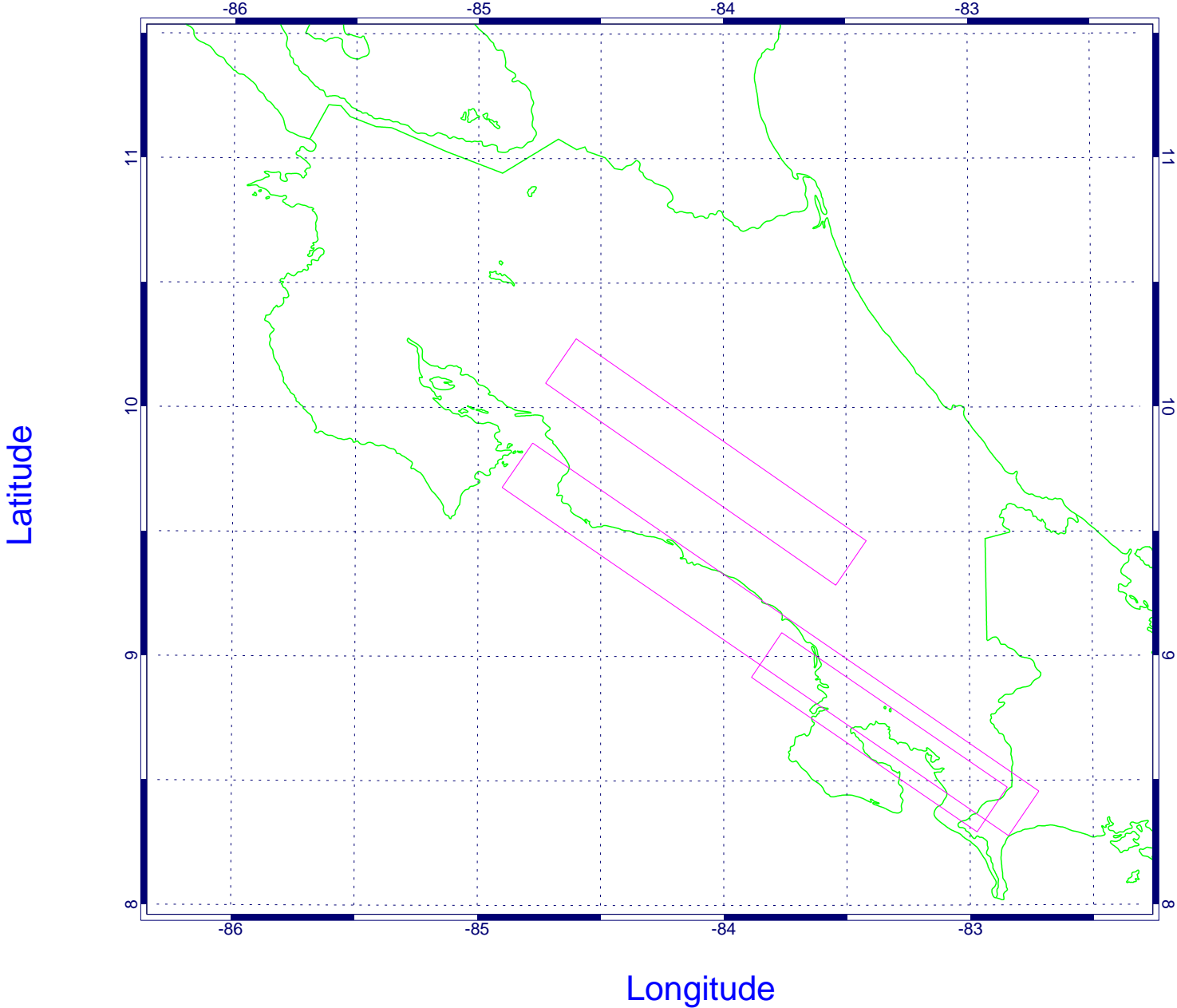
MASTER / RC-10

MODIS/ASTER AIRBORNE SIMULATOR (MASTER) FLIGHT LINE INFORMATION  
 FOR 13 Mar 2003  
 NASA FLIGHT NUMBER 03-003-06

				START OF FLIGHT LINE			END OF FLIGHT LINE			FLIGHT DATA				
FLTL	SITE	LINE	RUN	TIME	LAT	LON	TIME	LAT	LON	SCAN	SOLAR		HEAD	ALT
				HH:MM:SS	DEG	DEG	HH:MM:SS	DEG	DEG	LINES	ZEN	AZIM	DEG	M (MSL)
1	CRT	14	3	15:14:58	10.187	-84.663	15:33:59	9.375	-83.481	7095	37.5	108.2	126.95	13753
2	CRT	6B	1	15:44:53	9.006	-83.825	15:58:38	8.383	-82.910	5128	30.2	111.6	126.33	13861
3	CRT	7B	1	16:01:35	8.367	-82.782	16:31:05	9.768	-84.840	11016	25.3	117.8	300.31	13786

NUMBER OF FILES FOR THIS FLIGHT = 3  
 TOTAL NUMBER OF SCAN LINES = 23239  
 DATE THESE FILES WERE PROCESSED = 11-Jun-2003  
 DATE THIS LIST WAS CREATED = Thu Jun 26 12:17:12 PDT 2003  
 GRANULE VERSION = 1

MASTER AIRBORNE SIMULATOR 13 Mar 2003, 03-003-06, 3 FLIGHT LINES





# CAMERA FLIGHT LINE DATA

## FLIGHT NO. 03-003-06

Accession # 05748

Sensor # 076

Site #	Line #	Run #	Frame #	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
				START	END		
CRT	14	3	4893-4918	15:16:54	15:27:21	45100/13750	30-80% cumulus, frames 4893-4898; minor-10% cumulus, frames 4899-4901 and 4907-4910; minor- 20% cumulus frames 4912-4918
CRT	6B	1	4919-4947	15:46:39	15:58:18	45200/13780	Minor-40% cumulus
CRT	7B	1	4948-5011	16:04:48	16:30:51	45200/13780	10-70% cumulus; frames 4948-4971 and 4999-5007



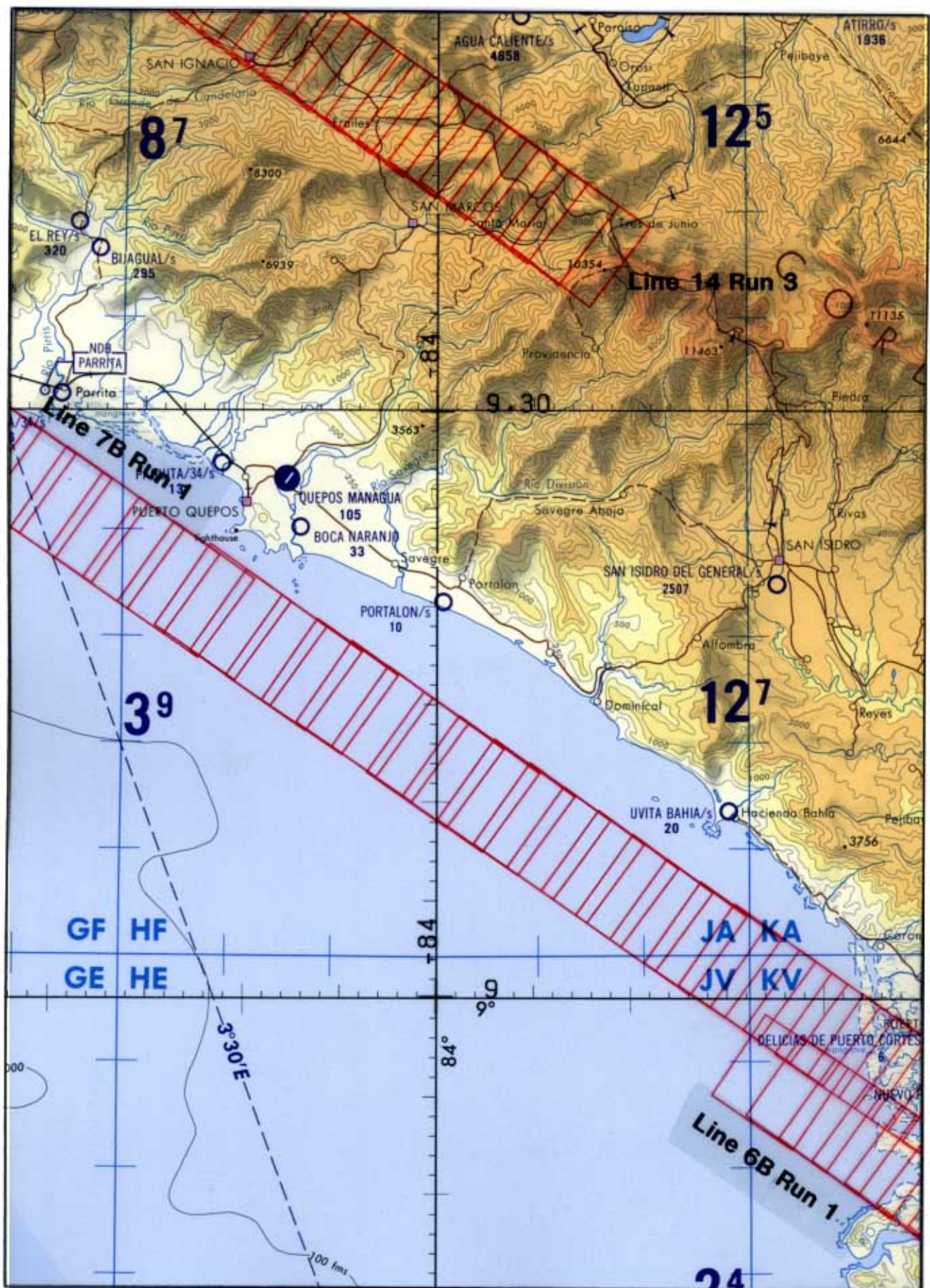
RC-10

A/C 926(JSC WB-57)

13 MARCH 2003

FLIGHT 03-003-06





RC-10

A/C 926(JSC WB-57)

13 MARCH 2003

FLIGHT 03-003-06





## FLIGHT SUMMARY REPORT

**Flight Number:** 03-003-08

**Calendar/Julian Date:** 20 March 2003 (079)

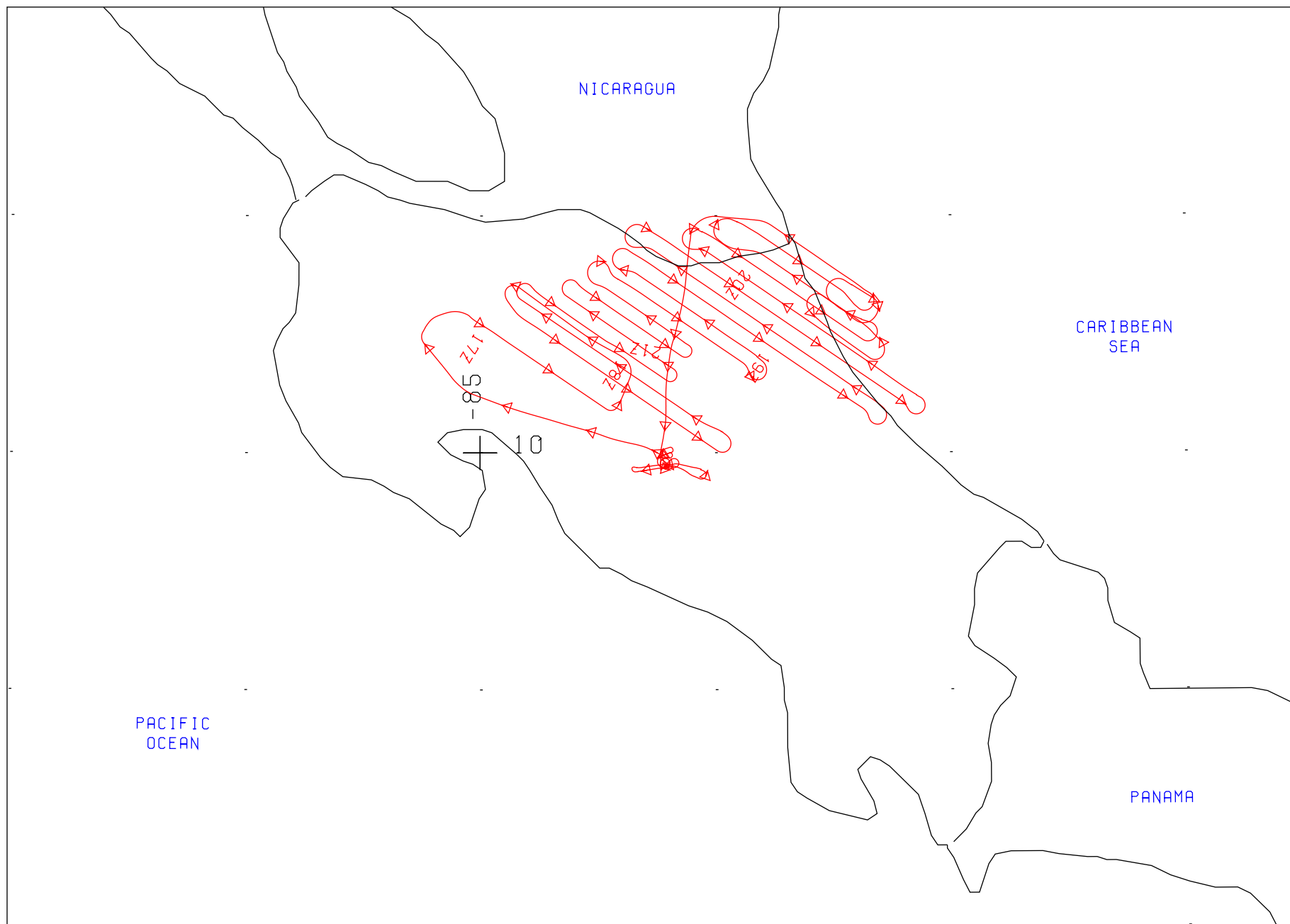
**Sensor Package:** Wild Heerbrugg RC-10  
MODIS/ASTER Airborne Simulator (MASTER)  
Airborne Volcanic Emissions Mass Spectrometer (AVEMS)

**Area(s) Covered:** Costa Rica

**Investigator(s):** Diaz, CENAT      **Aircraft Number:** 926  
NASA JSC WB-57

### SENSOR DATA

<b>Accession #:</b>	05749	-----	-----
<b>Sensor ID #:</b>	076	124	139
<b>Sensor Type:</b>	RC-10	MASTER	AVEMS
<b>Focal Length:</b>	12" 304.89 mm	-----	-----
<b>Film Type:</b>	Aerochrome IR SO-734	-----	-----
<b>Filtration:</b>	Wratten 12	-----	-----
<b>Spectral Band:</b>	510-900 nm	-----	-----
<b>f-Stop:</b>	11	-----	-----
<b>Shutter Speed:</b>	1/350	-----	-----
<b># of Frames:</b>	298	-----	-----
<b>% Overlap:</b>	60	-----	-----
<b>Quality:</b>	Excellent	-----	-----
<b>Remarks:</b>	Subtract 6 seconds for correct UTC		



FLIGHT 03-003-08

20 MARCH 2003

A/C 926

MASTER / RC-10

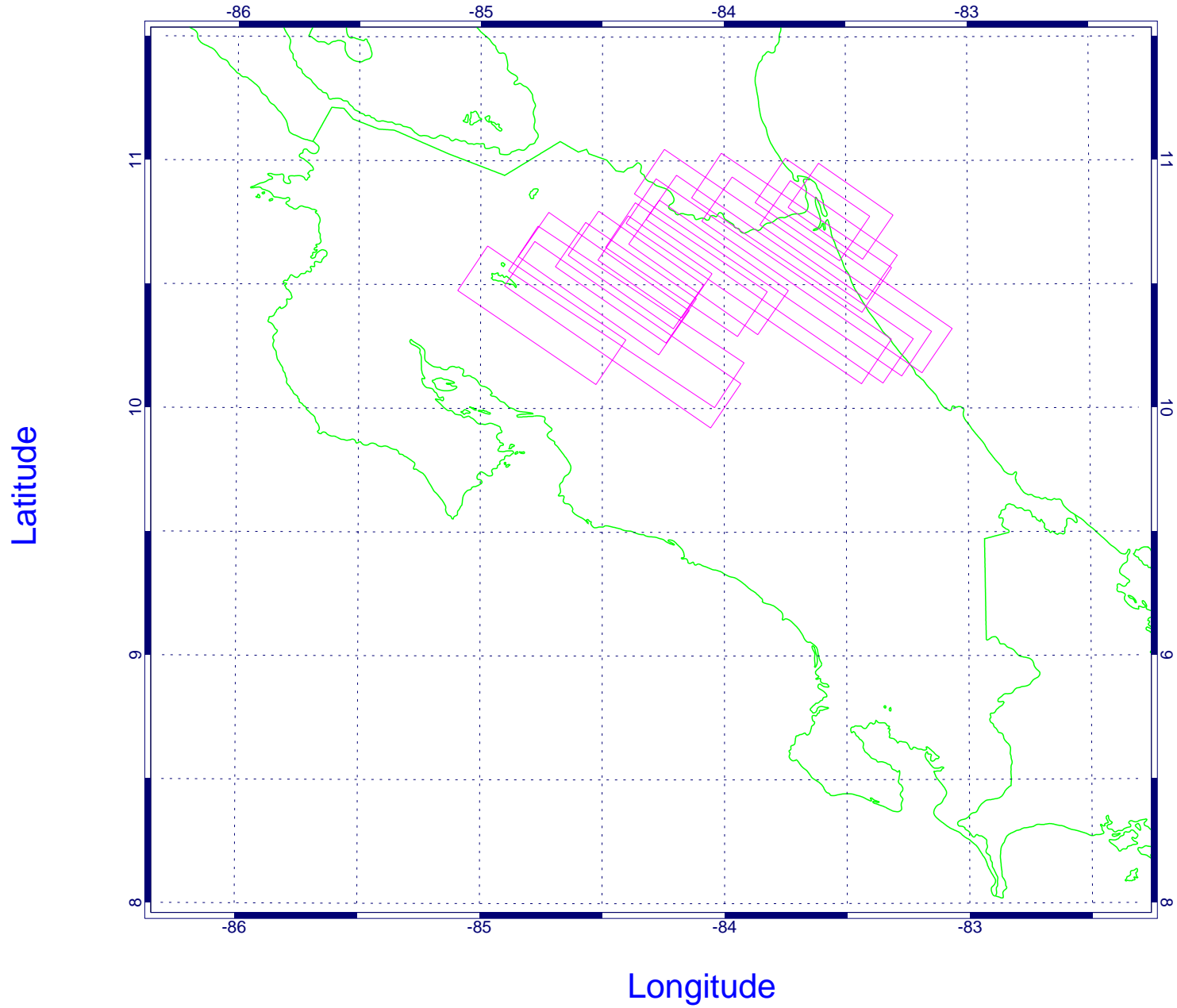


MODIS/ASTER AIRBORNE SIMULATOR (MASTER) FLIGHT LINE INFORMATION  
 FOR 20 Mar 2003  
 NASA FLIGHT NUMBER 03-003-08

FLTL	SITE	LINE	RUN	START OF FLIGHT LINE			END OF FLIGHT LINE			FLIGHT DATA				
				TIME HH:MM:SS	LAT DEG	LON DEG	TIME HH:MM:SS	LAT DEG	LON DEG	SCAN LINES	SOLAR ZEN	AZIM	HEAD DEG	ALT M (MSL)
1	CRT	16	4	16:59:24	10.566	-85.033	17:09:01	10.187	-84.465	3590	15.0	134.5	123.77	13778
2	CRT	18	3	17:22:13	10.585	-84.840	17:36:11	10.011	-83.994	5216	11.4	159.4	127.65	13788
3	CRT	19	2	17:38:21	10.094	-83.979	17:51:27	10.646	-84.825	4886	10.6	178.9	298.34	13788
4	CRT	20	2	17:53:09	10.703	-84.783	18:03:06	10.306	-84.206	3717	11.2	196.0	130.57	13790
5	CRT	21	2	18:04:20	10.354	-84.176	18:11:30	10.662	-84.631	2679	12.0	207.7	301.74	13777
6	CRT	22	1	18:13:25	10.708	-84.578	18:20:47	10.411	-84.146	2755	13.3	216.7	127.58	13785
7	CRT	23	2	18:22:05	10.455	-84.112	18:27:19	10.689	-84.456	1954	14.6	223.1	300.67	13779
8	CRT	24	1	18:30:49	10.741	-84.426	18:38:44	10.381	-83.884	2964	16.5	230.0	120.93	13814
9	CRT	25	3	18:41:20	10.387	-83.799	18:48:53	10.753	-84.329	2827	18.6	235.6	307.21	13792
10	CRT	26	2	18:52:05	10.838	-84.341	19:05:38	10.189	-83.375	5076	21.6	241.3	121.69	13818
11	CRT	27	1	19:08:01	10.191	-83.286	19:21:08	10.853	-84.258	4912	25.1	246.3	307.97	13793
12	CRT	28	1	19:24:13	10.957	-84.307	19:39:20	10.220	-83.210	5665	29.1	249.9	123.73	13823
13	CRT	29	1	19:41:36	10.232	-83.126	19:54:10	10.846	-84.029	4709	33.0	253.1	299.69	13783
14	CRT	30	1	19:56:55	10.941	-84.072	20:06:42	10.478	-83.373	3667	36.2	254.8	121.25	13824
15	CRT	31	1	20:25:17	10.529	-83.351	20:31:07	10.831	-83.790	2189	42.6	258.0	307.08	13808
16	CRT	32	1	20:36:47	10.921	-83.810	20:41:46	10.686	-83.463	1866	45.3	258.9	122.82	13809
17	CRT	33	1	20:44:56	10.691	-83.368	20:49:05	10.901	-83.674	1552	47.2	259.7	307.36	13823

NUMBER OF FILES FOR THIS FLIGHT = 17  
 TOTAL NUMBER OF SCAN LINES = 26688  
 DATE THESE FILES WERE PROCESSED = 11-Jun-2003  
 DATE THIS LIST WAS CREATED = Wed Jun 11 15:52:36 PDT 2003  
 GRANULE VERSION = 1

MASTER AIRBORNE SIMULATOR 20 Mar 2003, 03-003-08, 17 FLIGHT LINES



# CAMERA FLIGHT LINE DATA

## FLIGHT NO. 03-003-08

Accession # 05749

Page 1 of 2

Sensor # 076

Site #	Line #	Run #	Frame #	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
				START	END		
CRT	16	4	5027-5047	17:00:27	17:08:51	45200/13780	10-50% cumulus
CRT	18	3A	5048-5061	17:22:54	17:28:21	45200/13780	Minor-30% cumulus, frames 5048-5057
CRT	18	3B	5062-5064	17:34:41	17:35:31	45200/13780	10-20% cumulus
CRT	19	2	5065-5085	17:42:26	17:50:46	45200/13780	30-60% cumulus, frames 5065-5070; 10-20% cumulus, frames 5073-5085
CRT	20	2A	5086-5094	17:54:55	17:58:14	45200/13780	Minor-20% cumulus
CRT	20	2B	5095-5100	18:00:29	18:02:34	45200/13780	10-40% cumulus
CRT	21	2	5101-5116	18:04:55	18:11:09	45200/13780	Minor-30% cumulus
CRT	22	1	5117-5130	18:14:26	18:19:49	45200/13780	Minor-20% cumulus
CRT	23	2	5131-5140	18:23:36	18:27:19	45200/13780	Minor-20% cumulus
CRT	24	1	5141-5158	18:31:28	18:38:27	45200/13780	Minor-20% cumulus, frames 5141-5154; minor cumulus, frames 5157-5158
CRT	25	3	5159-5175	18:42:24	18:48:38	45200/13780	Minor cumulus, frames 5159-5161; minor-20% cumulus, frames 5165-5175



# CAMERA FLIGHT LINE DATA

## FLIGHT NO. 03-003-08

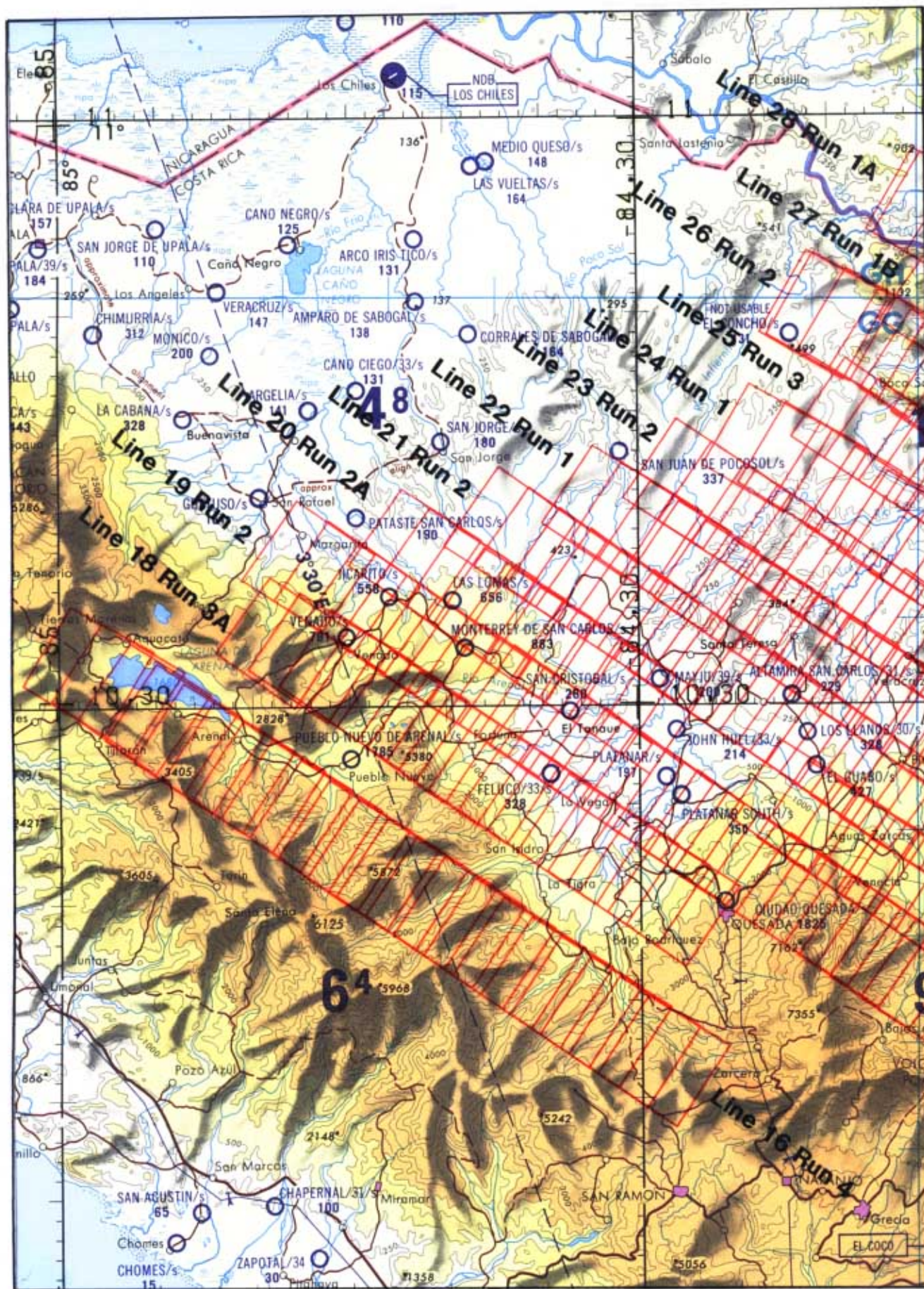
Accession # 05749

Page 2 of 2

Sensor # 076

Site #	Line #	Run #	Frame #	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
				START	END		
CRT	26	2	5176-5193	18:52:14	18:58:52	45400/13840	Minor-40% cumulus
CRT	27	1A	5194-5204	19:08:43	19:12:28	45200/13780	Minor cumulus, frames 5194-5195 and 5202-5204
CRT	27	1B	5205-5221	19:14:18	19:20:49	45200/13780	10-50% cumulus
CRT	28	1A	5222-5235	19:25:14	19:30:12	45400/13840	Minor-40% cumulus
CRT	28	1B	5236-5251	19:32:57	19:38:44	45500/13870	20% cumulus, frames 5236-5237; 10% cumulus frame 5251
CRT	29	1A	5252-5267	19:43:52	19:49:38	45200/13780	Minor-10% cumulus, frames 5265-5267
CRT	29	1B	5268-5274	19:51:51	19:53:58	45200/13780	10-30% cumulus
CRT	30	1	5275-5291	20:00:33	20:06:43	45500/13870	Minor-40% cumulus, frames 5275-5280
CRT	31	1	5292-5304	20:26:26	20:30:57	45400/13840	10-30% cumulus, frames 5303-5304
CRT	32	1	5305-5315	20:37:39	20:41:21	45200/13780	10-20% cumulus, frames 5305-5308
CRT	33	1	5316-5324	20:46:58	20:49:53	45400/13840	Clear, some cloud shadow, frames 5321-5323





RC-10

A/C 926 (JSC NB-57)

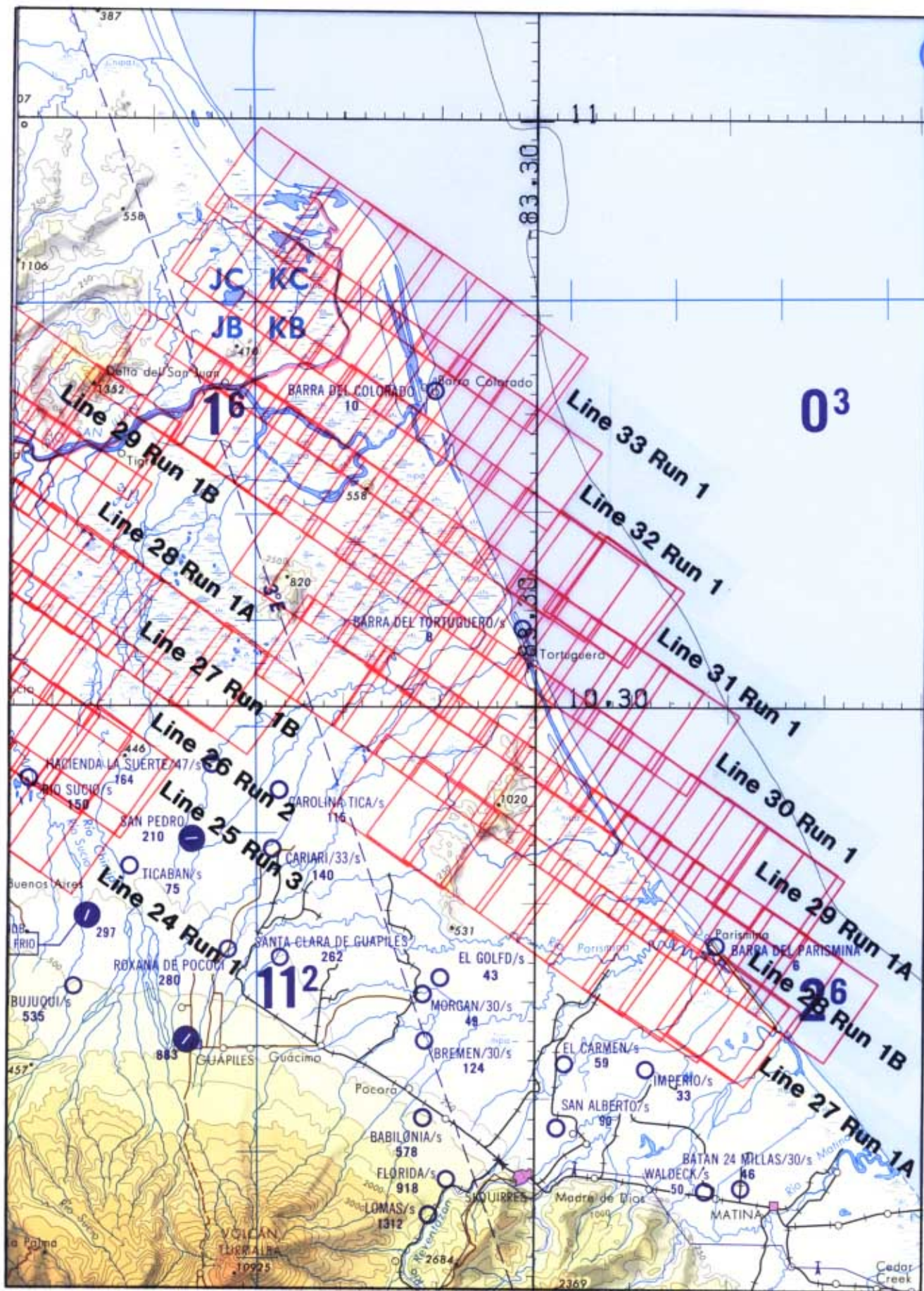
20 MARCH 2003

FLIGHT 03-003-08









RC-10

A/C 926(JSC WB-57)

20 MARCH 2003

FLIGHT 03-003-08

## FLIGHT SUMMARY REPORT

**Flight Number:** 03-003-09

**Calendar/Julian Date:** 21 March 2003 (080)

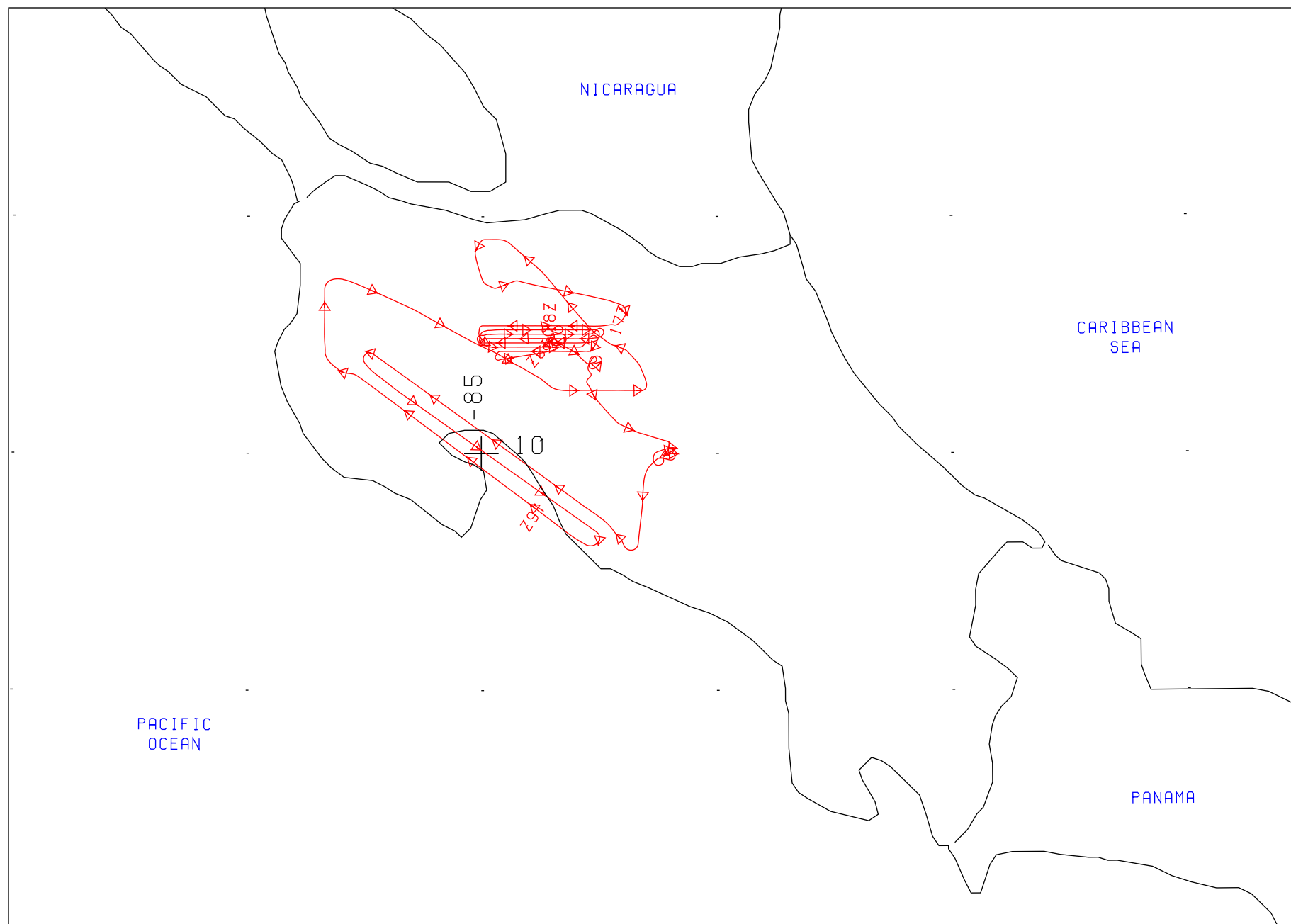
**Sensor Package:** Wild Heerbrugg RC-10  
MODIS/ASTER Airborne Simulator (MASTER)  
Airborne Volcanic Emissions Mass Spectrometer (AVEMS)

**Area(s) Covered:** Gulf of Nicoya/Mt. Arenal, Costa Rica

**Investigator(s):** Diaz, CENAT      **Aircraft Number:** 926  
NASA JSC WB-57

### SENSOR DATA

<b>Accession #:</b>	05750	-----	-----
<b>Sensor ID #:</b>	076	124	139
<b>Sensor Type:</b>	RC-10	MASTER	AVEMS
<b>Focal Length:</b>	12" 304.89 mm	-----	-----
<b>Film Type:</b>	Aerochrome IR SO-734	-----	-----
<b>Filtration:</b>	Wratten 12	-----	-----
<b>Spectral Band:</b>	510-900 nm	-----	-----
<b>f-Stop:</b>	11	-----	-----
<b>Shutter Speed:</b>	1/350	-----	-----
<b># of Frames:</b>	63	-----	-----
<b>% Overlap:</b>	60	-----	-----
<b>Quality:</b>	Excellent	-----	-----
<b>Remarks:</b>	Subtract 4 seconds for correct UTC		



FLIGHT 03-003-09

21 MARCH 2003

A/C 926

MASTER / RC-10

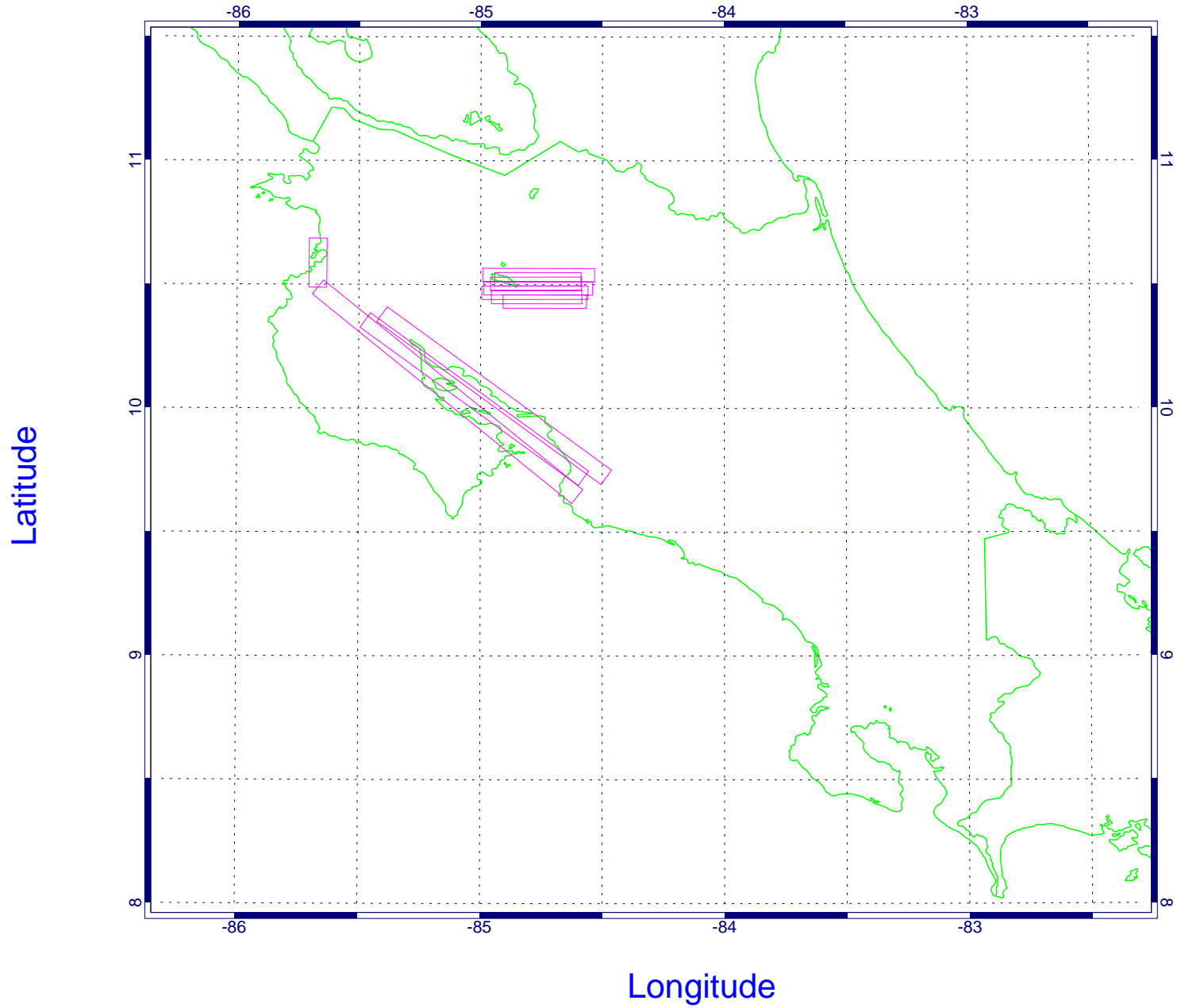


MODIS/ASTER AIRBORNE SIMULATOR (MASTER) FLIGHT LINE INFORMATION  
 FOR 21 Mar 2003  
 NASA FLIGHT NUMBER 03-003-09

FLTL	SITE	LINE	RUN	START OF FLIGHT LINE			END OF FLIGHT LINE			FLIGHT DATA				
				TIME HH:MM:SS	LAT DEG	LON DEG	TIME HH:MM:SS	LAT DEG	LON DEG	SCAN LINES	SOLAR ZEN	AZIM	HEAD DEG	ALT M (MSL)
1	NIC	01	1	15:26:34	9.722	-84.484	15:43:43	10.380	-85.405	25635	34.4	104.7	309.41	4868
2	NIC	02	1	15:46:25	10.356	-85.474	16:03:01	9.718	-84.578	24819	29.8	107.7	124.92	4863
3	NIC	03	1	16:06:40	9.644	-84.603	16:27:38	10.489	-85.669	31364	24.7	112.4	332.12	4888
4	SUL	01	1	16:27:37	10.488	-85.669	16:30:54	10.686	-85.668	4914	22.7	116.0	359.00	4895
5	ARN	01	1	17:33:08	10.538	-84.532	17:42:06	10.539	-84.992	13405	10.6	167.6	270.31	3453
6	ARN	02	1	17:46:51	10.522	-84.942	17:53:51	10.522	-84.588	10457	10.4	185.1	88.00	3460
7	ARN	05	1	17:57:29	10.468	-84.559	18:06:04	10.467	-84.995	12825	10.9	200.2	269.97	3453
8	ARN	03	1	18:08:02	10.503	-84.960	18:15:15	10.504	-84.586	10782	12.0	211.3	88.05	3461
9	ARN	04	1	18:19:06	10.485	-84.540	18:27:47	10.485	-84.987	12995	13.7	222.2	269.31	3453
10	ARN	06	1	18:29:22	10.450	-84.956	18:36:31	10.450	-84.584	10695	15.4	229.0	90.28	3456
11	ARN	07	1	18:40:25	10.432	-84.565	18:47:04	10.432	-84.908	9945	17.5	235.2	269.51	3443

NUMBER OF FILES FOR THIS FLIGHT = 11  
 TOTAL NUMBER OF SCAN LINES = 167836  
 DATE THESE FILES WERE PROCESSED = 13-Jun-2003  
 DATE THIS LIST WAS CREATED = Fri Jun 13 16:11:09 PDT 2003  
 GRANULE VERSION = 1

MASTER AIRBORNE SIMULATOR 21 Mar 2003, 03-003-09, 11 FLIGHT LINES



# CAMERA FLIGHT LINE DATA

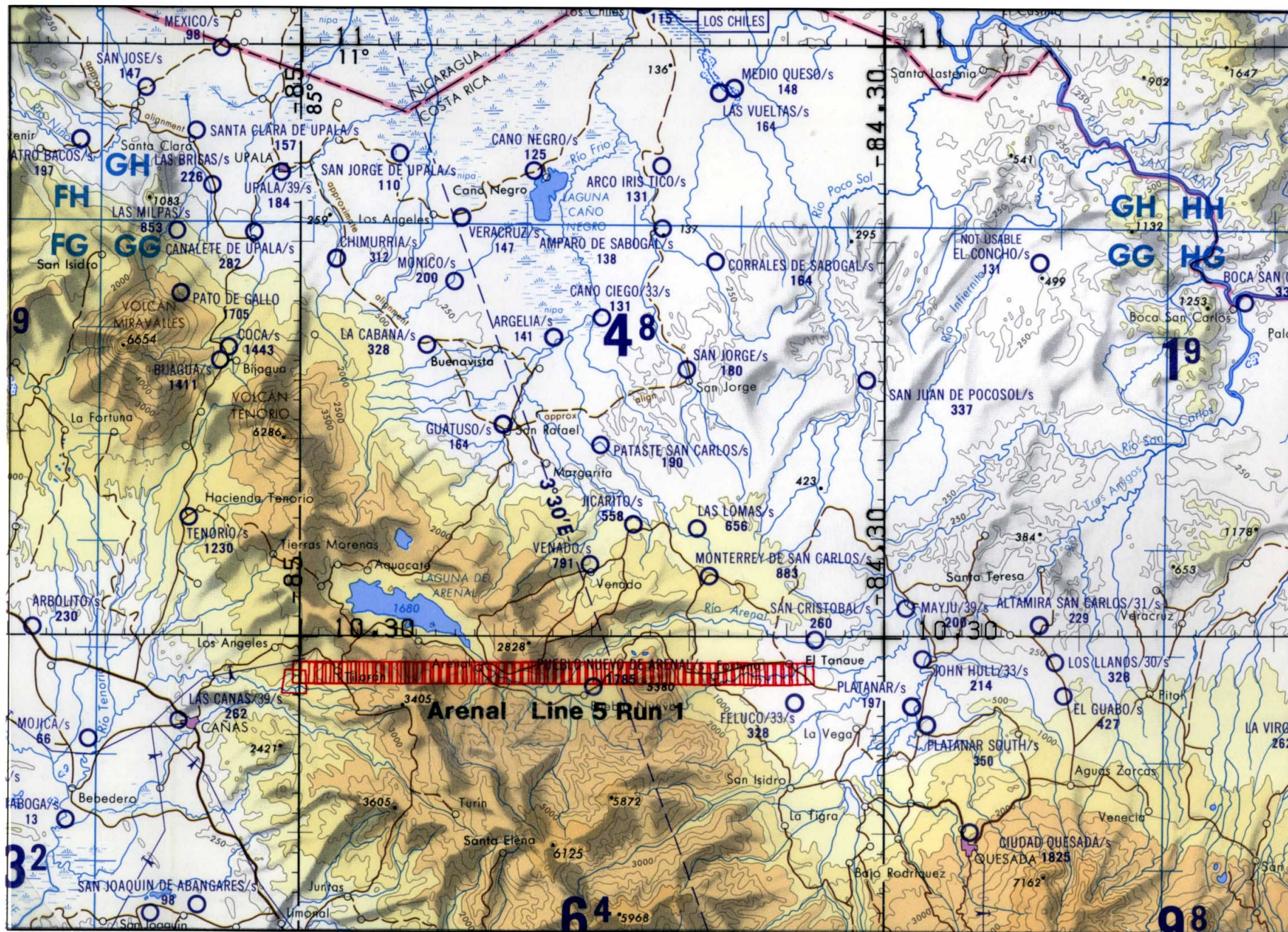
## FLIGHT NO. 03-003-09

Accession # 05750

Sensor # 076

Site #	Line #	Run #	Frame #	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
				START	END		
ARN	5	1	5339-5401	17:57:49	18:06:12	11300/3450	10-40% cumulus, frames 5339-5351 and 5354-5363; 10-50% cumulus, frames 5368-5378, 40-100% cumulus, frames 5379-5381; 10-20% cumulus, frames 5382, 5384-5388, 5391-5392 and 5397 60-100% cumulus, frames 5398-5401; frame 5401 oblique





FLIGHT 03-003-09

21 MARCH 2003

A/C 926(JSC WB-57)

RC-10



## FLIGHT SUMMARY REPORT

**Flight Number:** 03-003-10

**Calendar/Julian Date:** 22 March 2003 (081)

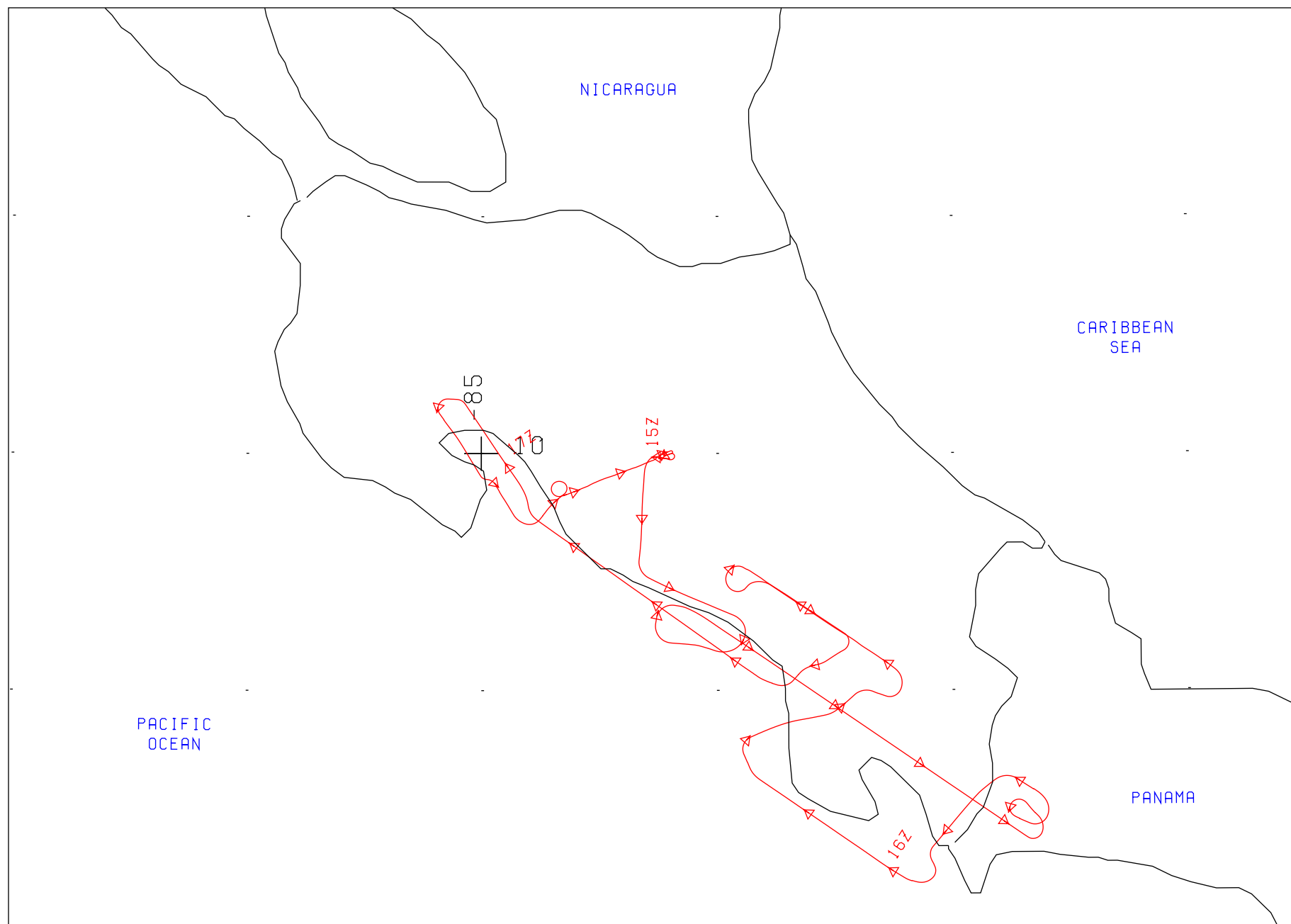
**Sensor Package:** Wild Heerbrugg RC-10  
MODIS/ASTER Airborne Simulator (MASTER)  
Airborne Volcanic Emissions Mass Spectrometer (AVEMS)

**Area(s) Covered:** Costa Rica

**Investigator(s):** Diaz, CENAT      **Aircraft Number:** 926  
NASA JSC WB-57

### SENSOR DATA

<b>Accession #:</b>	05751	-----	-----
<b>Sensor ID #:</b>	076	124	139
<b>Sensor Type:</b>	RC-10	MASTER	AVEMS
<b>Focal Length:</b>	12" 304.89 mm	-----	-----
<b>Film Type:</b>	Aerochrome IR SO-734	-----	-----
<b>Filtration:</b>	Wratten 12	-----	-----
<b>Spectral Band:</b>	510-900 nm	-----	-----
<b>f-Stop:</b>	11	-----	-----
<b>Shutter Speed:</b>	1/350	-----	-----
<b># of Frames:</b>	84	-----	-----
<b>% Overlap:</b>	60	-----	-----
<b>Quality:</b>	Excellent	-----	-----
<b>Remarks:</b>	Subtract 7 seconds for correct UTC		



FLIGHT 03-003-10

22 MARCH 2003

A/C 926

MASTER / RC-10

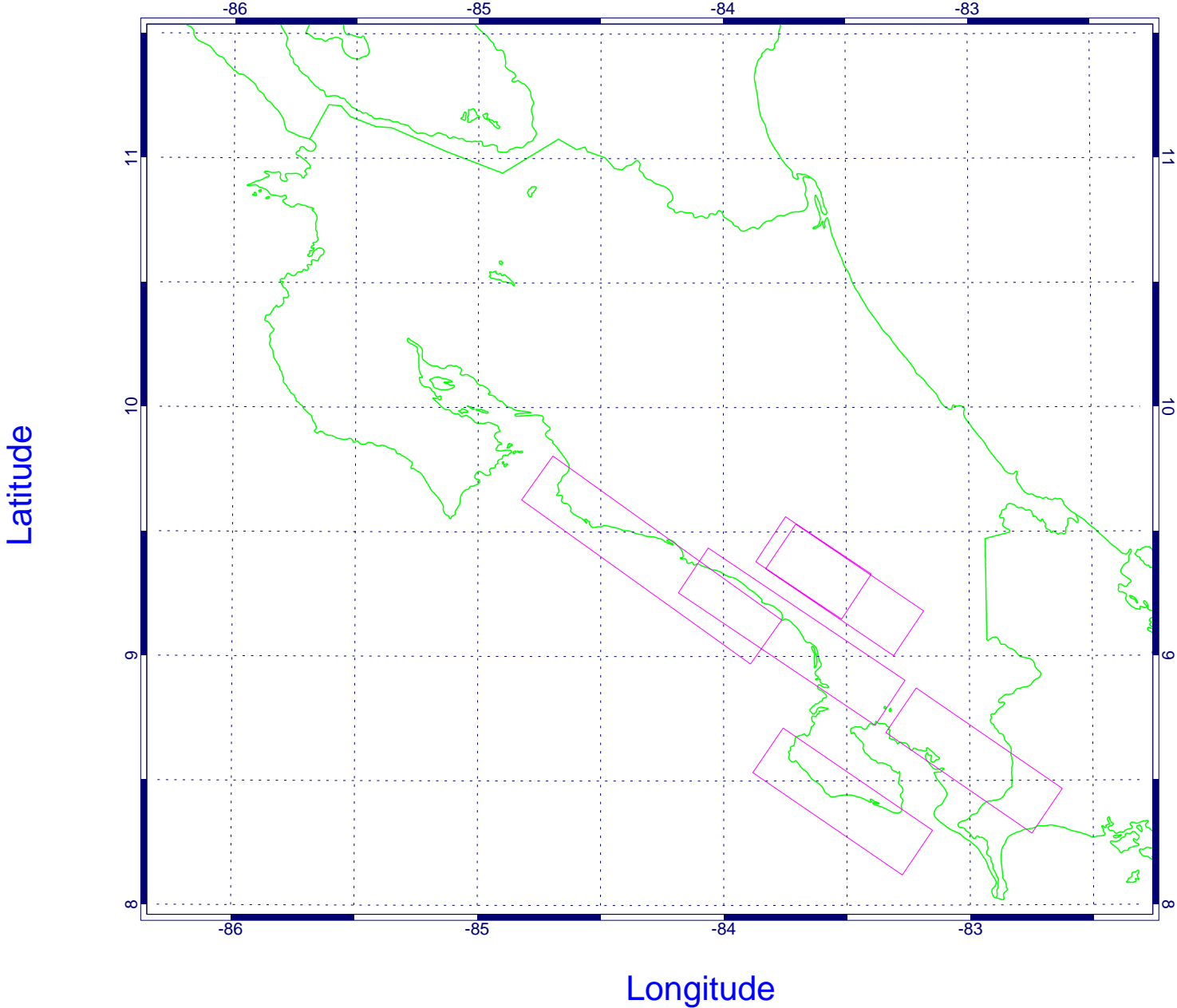


MODIS/ASTER AIRBORNE SIMULATOR (MASTER) FLIGHT LINE INFORMATION  
 FOR 22 Mar 2003  
 NASA FLIGHT NUMBER 03-003-10

FLTL	SITE	LINE	RUN	START OF FLIGHT LINE			END OF FLIGHT LINE			FLIGHT DATA				
				TIME HH:MM:SS	LAT DEG	LON DEG	TIME HH:MM:SS	LAT DEG	LON DEG	SCAN LINES	SOLAR ZEN	AZIM	HEAD DEG	ALT M (MSL)
1	CRT	08	2	15:21:32	9.346	-84.123	15:32:21	8.813	-83.323	4033	34.7	102.3	122.23	13782
2	CRT	08	3	15:32:57	8.783	-83.279	15:41:14	8.377	-82.687	3093	31.4	103.1	124.55	13788
3	CRT	1B	1	15:59:14	8.211	-83.214	16:07:37	8.623	-83.820	3135	25.6	106.5	300.57	13752
4	CRT	12	3	16:19:22	9.092	-83.247	16:26:22	9.442	-83.767	2621	21.4	112.9	302.60	13785
5	CRT	12	4	16:31:36	9.471	-83.808	16:36:50	9.240	-83.459	1961	19.0	116.6	125.92	13742
6	CRT	7B	2	16:43:14	9.058	-83.827	16:56:45	9.717	-84.759	5063	16.2	122.3	302.57	13785

NUMBER OF FILES FOR THIS FLIGHT = 6  
 TOTAL NUMBER OF SCAN LINES = 19906  
 DATE THESE FILES WERE PROCESSED = 20-Jun-2003  
 DATE THIS LIST WAS CREATED = Thu Jun 26 13:35:57 PDT 2003  
 GRANULE VERSION = 1

MASTER AIRBORNE SIMULATOR 22 Mar 2003, 03-003-10, 6 FLIGHT LINES



# CAMERA FLIGHT LINE DATA

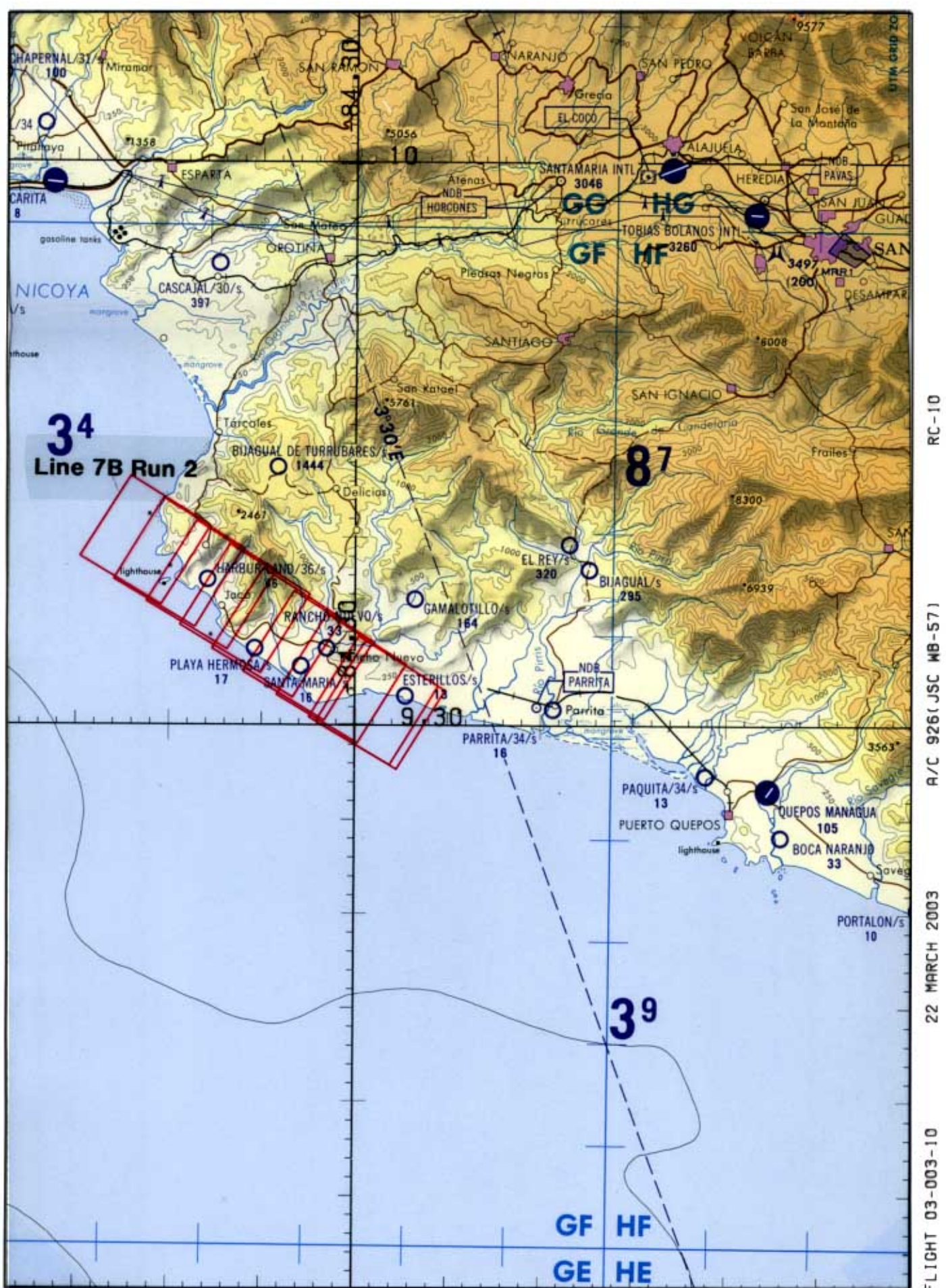
## FLIGHT NO. 03-003-10

Accession # 05751

Sensor # 076

Site #	Line #	Run #	Frame #	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
				START	END		
CRT	8	2	5415-5451	15:25:01	15:40:07	45200/13780	Minor-30% cumulus, frames 5421-5426; minor-40% cumulus, 5429-5451
CRT	1B	1	5452-5467	16:01:03	16:07:17	45200/13780	10% cumulus, frames 5459-5461 and 5465-5466
CRT	12	3	5468-5477	16:22:25	16:26:08	45100/13750	Minor-40% cumulus
CRT	12	4	5478-5489	16:32:02	16:36:34	45000/13720	Minor-40% cumulus
CRT	7B	2	5490-5498	16:52:49	16:55:46	45400/13840	Minor-20% cumulus





RC-10

A/C 926(JSC WB-57)

22 MARCH 2003

FLIGHT 03-003-10





RC-10

A/C 926(JSC WB-57)

22 MARCH 2003

FLIGHT 03-003-10





RC-10

A/C 926(JSC WB-57)

22 MARCH 2003

FLIGHT 03-003-10



## FLIGHT SUMMARY REPORT

**Flight Number:** 03-003-11

**Calendar/Julian Date:** 23 March 2003 (082)

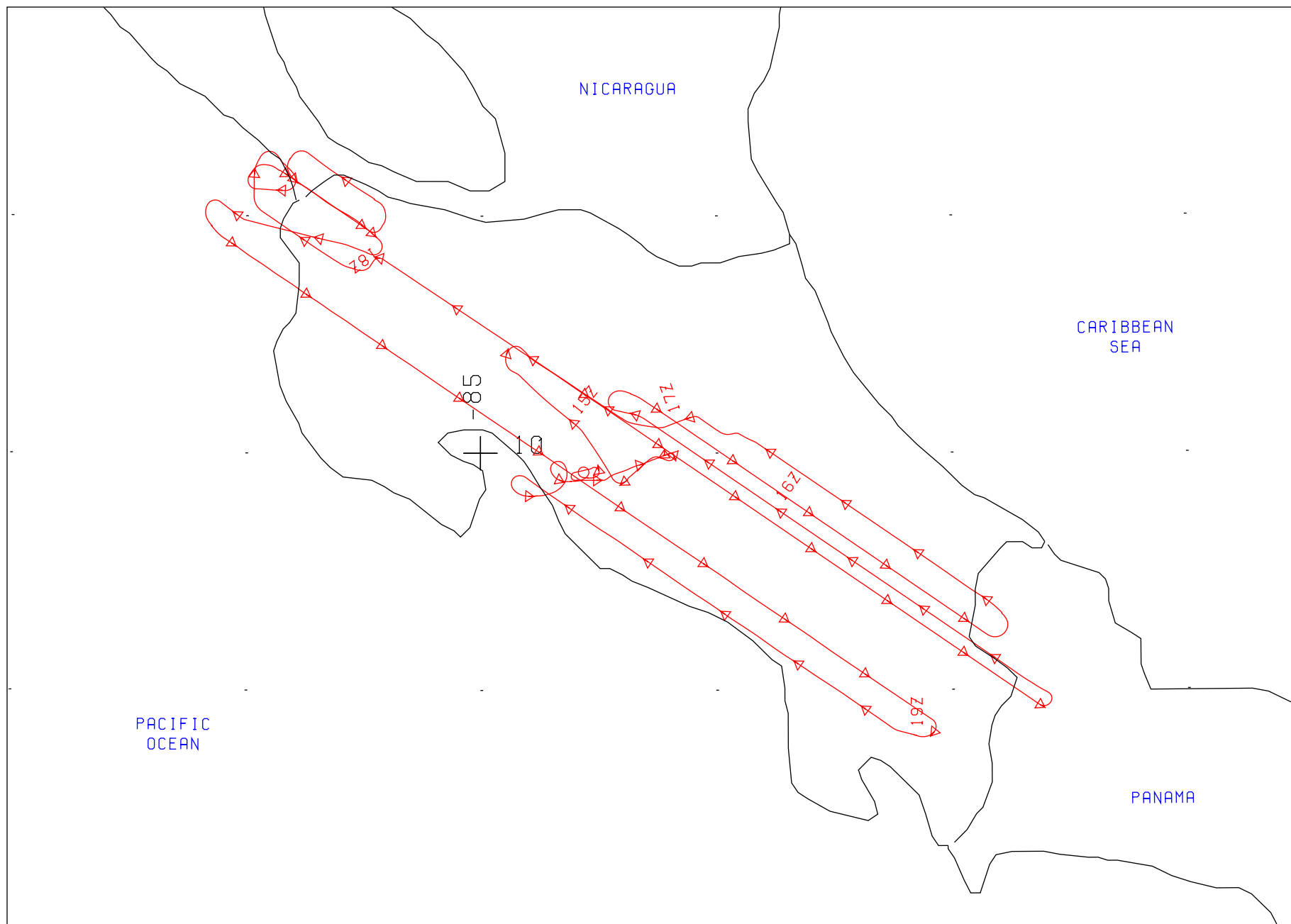
**Sensor Package:** Wild Heerbrugg RC-10  
MODIS/ASTER Airborne Simulator (MASTER)  
Airborne Volcanic Emissions Mass Spectrometer (AVEMS)

**Area(s) Covered:** Costa Rica

**Investigator(s):** Diaz, CENAT      **Aircraft Number:** 926  
NASA JSC WB-57

### SENSOR DATA

<b>Accession #:</b>	05752	05753	-----	-----
<b>Sensor ID #:</b>	034	076	124	139
<b>Sensor Type:</b>	RC-10	RC-10	MASTER	AVEMS
<b>Focal Length:</b>	12" 304.66 mm	12" 304.89 mm	-----	-----
<b>Film Type:</b>	Aerochrome IR SO-734	Aerochrome IR SO-734	-----	-----
<b>Filtration:</b>	Wratten 12	Wratten 12	-----	-----
<b>Spectral Band:</b>	510-900 nm	510-900 nm	-----	-----
<b>f-Stop:</b>	11	11	-----	-----
<b>Shutter Speed:</b>	1/350	1/350	-----	-----
<b># of Frames:</b>	268	88	-----	-----
<b>% Overlap:</b>	60	60	-----	-----
<b>Quality:</b>	Excellent	Excellent	-----	-----
<b>Remarks:</b>	Subtract 3 seconds for correct UTC	Subtract 7 seconds for correct UTC		



FLIGHT 03-003-11

23 MARCH 2003

A/C 926

MASTER / DUAL RC-10

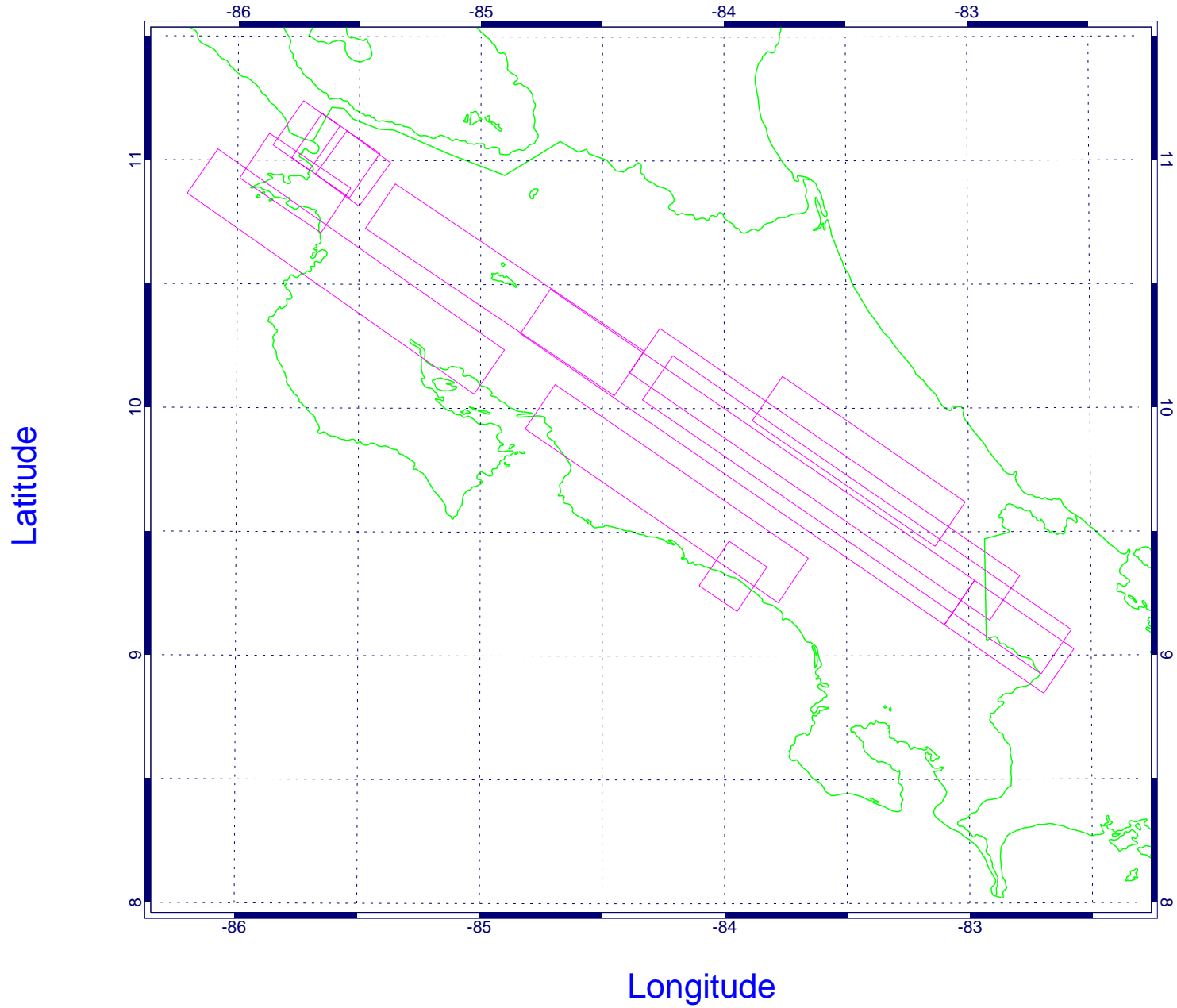
MODIS/ASTER AIRBORNE SIMULATOR (MASTER) FLIGHT LINE INFORMATION  
 FOR 23 Mar 2003  
 NASA FLIGHT NUMBER 03-003-11

FLTL	SITE	LINE	RUN	START OF FLIGHT LINE			END OF FLIGHT LINE			FLIGHT DATA				
				TIME HH:MM:SS	LAT DEG	LON DEG	TIME HH:MM:SS	LAT DEG	LON DEG	SCAN LINES	SOLAR ZEN	AZIM	HEAD DEG	ALT M (MSL)
1	CRT	16	5	15:06:43	10.392	-84.775	15:33:30	9.214	-83.038	9999	36.5	101.8	127.53	13589
2	CRT	16	6	15:33:31	9.214	-83.038	15:39:45	8.936	-82.633	2329	31.3	103.2	126.86	13788
3	CRT	17	2	15:41:56	9.014	-82.643	16:08:43	10.124	-84.273	9999	27.7	106.8	300.40	13787
4	CRT	18	4	16:13:35	10.234	-84.326	16:36:05	9.232	-82.853	8416	21.0	114.0	125.12	13821
5	CRT	20	3	16:43:31	9.531	-83.075	16:55:27	10.040	-83.823	4466	15.5	123.9	301.53	13824
6	CRT	16	7	17:03:32	10.142	-84.390	17:19:17	10.816	-85.413	5896	13.0	137.0	303.19	13845
7	CRT	14	4	17:22:04	10.798	-85.596	17:27:20	11.018	-85.931	1974	11.7	147.1	301.40	13802
8	CRT	17	3	17:41:15	11.100	-85.716	17:44:52	10.939	-85.478	1357	10.1	171.0	126.48	13854
9	CRT	17	4	17:54:28	11.151	-85.793	17:56:41	11.049	-85.643	828	10.2	188.1	129.97	13853
10	CRT	17	5	17:57:04	11.032	-85.616	17:59:49	10.903	-85.436	1031	10.2	193.3	129.36	13800
11	CRT	11	1	18:12:52	10.955	-86.145	18:31:10	10.147	-84.964	6859	12.8	219.8	134.70	13855
12	CRT	11	2	18:34:13	10.007	-84.755	18:49:04	9.305	-83.718	5567	16.8	239.3	126.50	13847
13	CRT	09	2	19:12:57	9.270	-83.887	19:15:22	9.374	-84.042	902	24.2	251.3	301.86	13855

NUMBER OF FILES FOR THIS FLIGHT = 13  
 TOTAL NUMBER OF SCAN LINES = 59623  
 DATE THESE FILES WERE PROCESSED = 09-Jun-2003  
 DATE THIS LIST WAS CREATED = Mon Jun 9 12:19:18 PDT 2003  
 GRANULE VERSION = 1



MASTER AIRBORNE SIMULATOR 23 Mar 2003, 03-003-11, 13 FLIGHT LINES



# CAMERA FLIGHT LINE DATA

## FLIGHT NO. 03-003-11

Accession # 05752

Sensor # 034

Site #	Line #	Run #	Frame #	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
				START	END		
CRT	16	5-6	7886-7962	15:07:15	15:39:28	45200/13780	10-90% cumulus, frames 7886-7898; minor-10% cumulus, frames 7920-7924, 7926-7933, 7941-7948 and 7962
CRT	17	2	7963-8006	15:44:57	16:02:44	45200/13780	Minor cumulus, frames 7971-7973; 10-40% cumulus, frames 7995-8002
CRT	18	4	8007-8058	16:14:18	16:35:14	45500/13870	20-40% cumulus, frames 8007-8009; minor cumulus, frames 8010-8013 and 8041-8043; 10-50% cumulus, frames 8015-8035; 10-60% cumulus, frames 8044-8058
CRT	20	3A	8059-8067	16:46:45	16:49:44	45500/13870	10-60% cumulus
CRT	20	3B	8068-8073	16:53:13	16:54:58	45400/13840	30-50% cumulus
CRT	16	7	8074-8092	17:12:12	17:19:16	45200/13780	10-30% cumulus, frames 8074-8080; 10% cumulus frames 8086-8090
CRT	14	4	8093-8102	17:23:49	17:27:11	45300/13810	Minor-20% cumulus, frames 8093-8096
CRT	17	3	8103-8105	17:43:29	17:43:59	45500/13870	Minor cumulus
CRT	19	-	8106-8115	17:47:40	17:51:01	45400/13840	10-40% cumulus
CRT	17	4-5	8116-8126	17:55:42	17:59:28	45300/13810	Minor-30% cumulus
CRT	11	1	8127-8153	18:14:28	18:24:45	45400/13840	Minor cumulus, frames 8141-8150

# CAMERA FLIGHT LINE DATA

## FLIGHT NO. 03-003-11

Accession # 05753

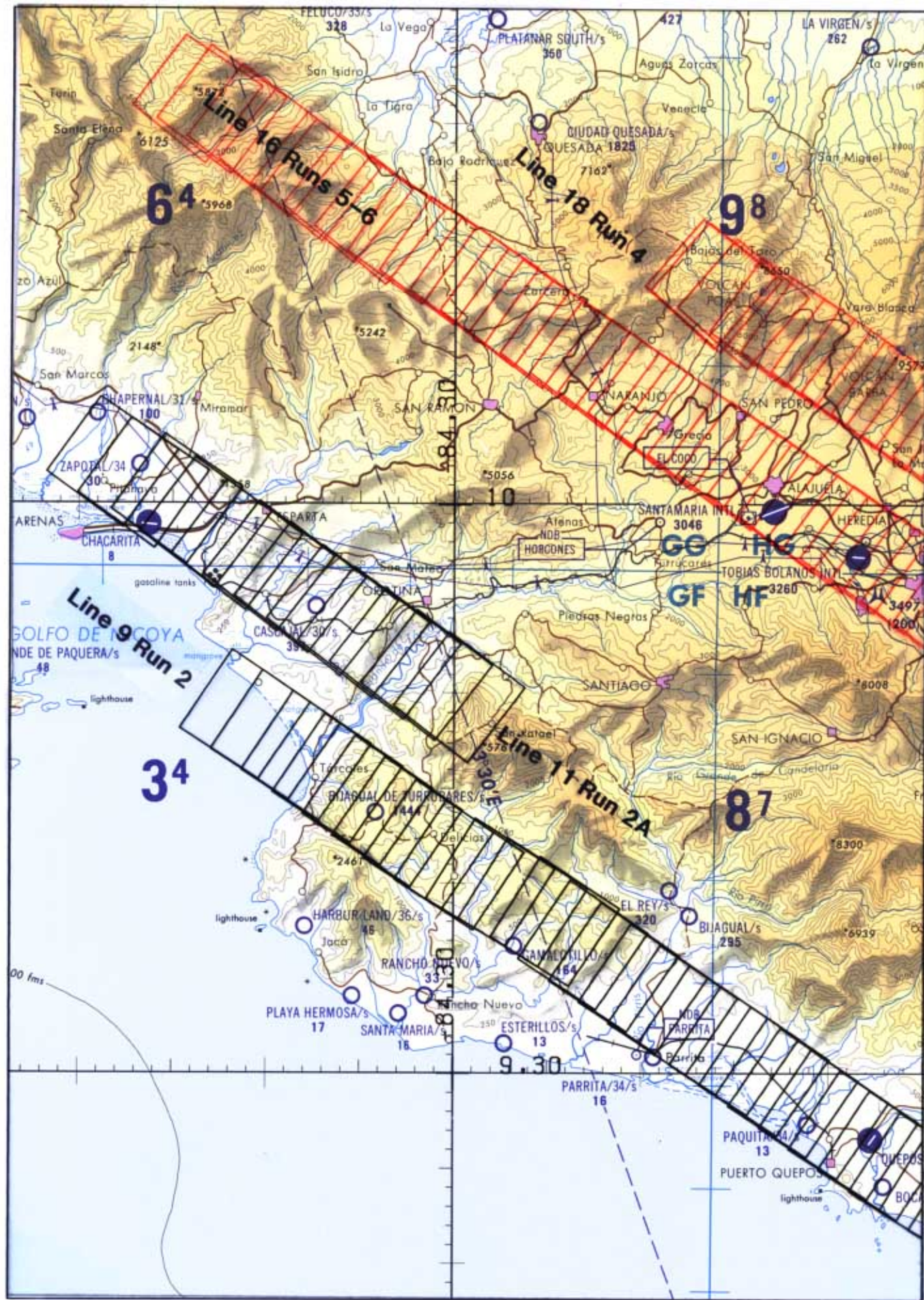
Sensor # 076

Site #	Line #	Run #	Frame #	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
				START	END		
CRT	11	2A	5509-5520	18:33:37	18:38:03	45500/13870	Minor-30% cumulus
CRT	11	2B	5521-5529	18:48:00	18:50:55	45400/13840	10-30% cumulus
CRT	11	2C	5530-5538	18:54:22	18:57:35	45400/13840	Minor-40% cumulus
CRT	9	2	5539-5596	19:02:23	19:25:07	45500/13870	Minor-40% cumulus, frames 5539-5580 and 5583-5585; 50-80% cumulus, frames 5581-5582 and 5586-5591; 20-40% cumulus, frames 5592-5593









RC-10

A/C 926(JSC WB-57)

23 MARCH 2003

FLIGHT 03-003-11















## FLIGHT SUMMARY REPORT

**Flight Number:** 03-003-13

**Calendar/Julian Date:** 25 March 2003 (084)

**Sensor Package:** Wild Heerbrugg RC-10  
MODIS/ASTER Airborne Simulator (MASTER)  
Airborne Volcanic Emissions Mass Spectrometer (AVEMS)

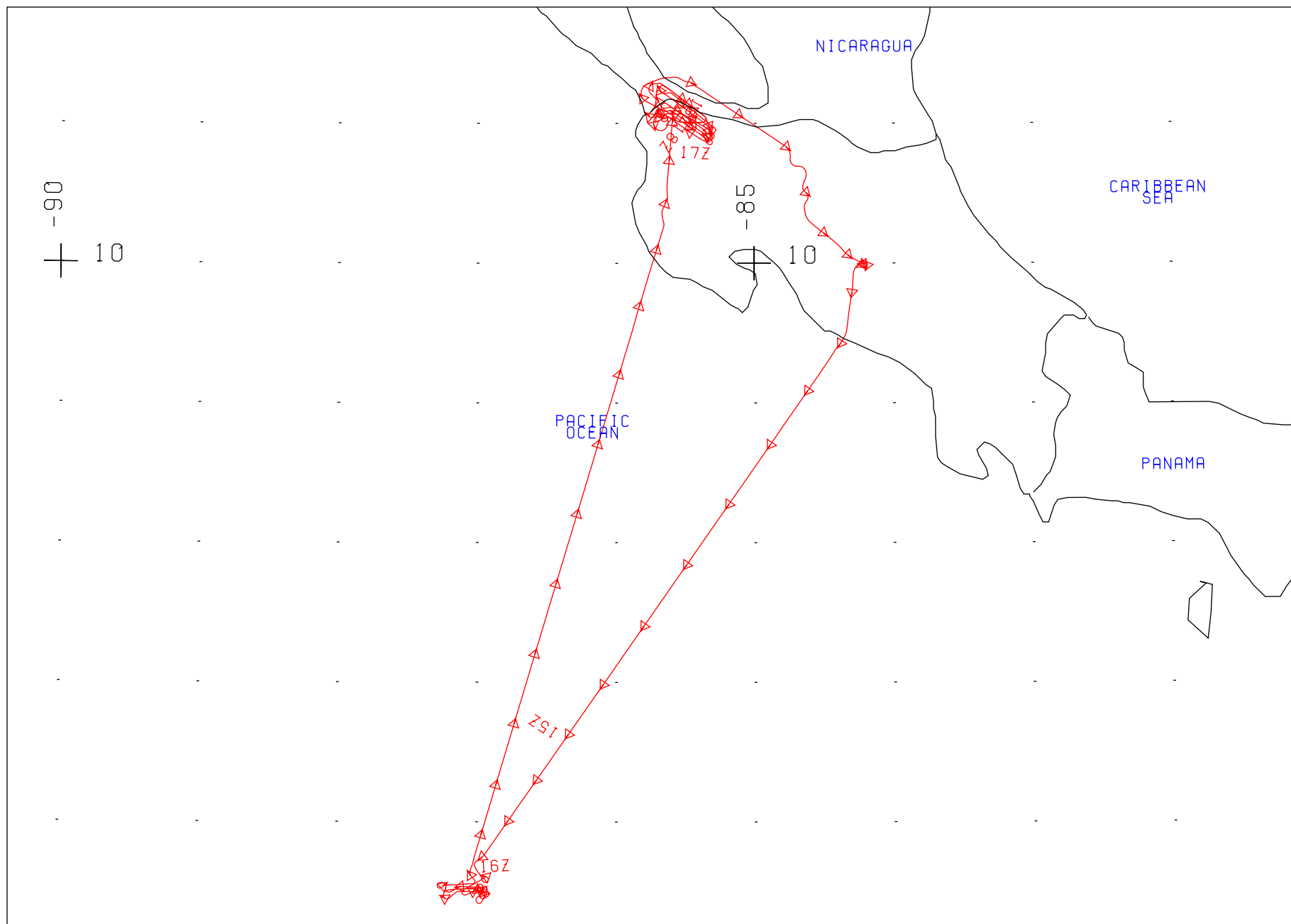
**Area(s) Covered:** Coco Island/Los Innocentes, Costa Rica

**Investigator(s):** Diaz, CENAT      **Aircraft Number:** 926  
NASA JSC WB-57

### SENSOR DATA

<b>Accession #:</b>	05754	-----	-----
<b>Sensor ID #:</b>	034	124	139
<b>Sensor Type:</b>	RC-10	MASTER	AVEMS
<b>Focal Length:</b>	12" 304.66 mm	-----	-----
<b>Film Type:</b>	Aerochrome IR SO-734	-----	-----
<b>Filtration:</b>	Wratten 12	-----	-----
<b>Spectral Band:</b>	510-900 nm	-----	-----
<b>f-Stop:</b>	11	-----	-----
<b>Shutter Speed:</b>	1/300	-----	-----
<b># of Frames:</b>	56	-----	-----
<b>% Overlap:</b>	60	-----	-----
<b>Quality:</b>	Excellent	-----	-----
<b>Remarks:</b>	Subtract 4 seconds for correct UTC		





FLIGHT 03-003-13

25 MARCH 2003

A/C 926

MASTER / RC-10

MODIS/ASTER AIRBORNE SIMULATOR (MASTER) FLIGHT LINE INFORMATION  
FOR 25 Mar 2003  
NASA FLIGHT NUMBER 03-003-13

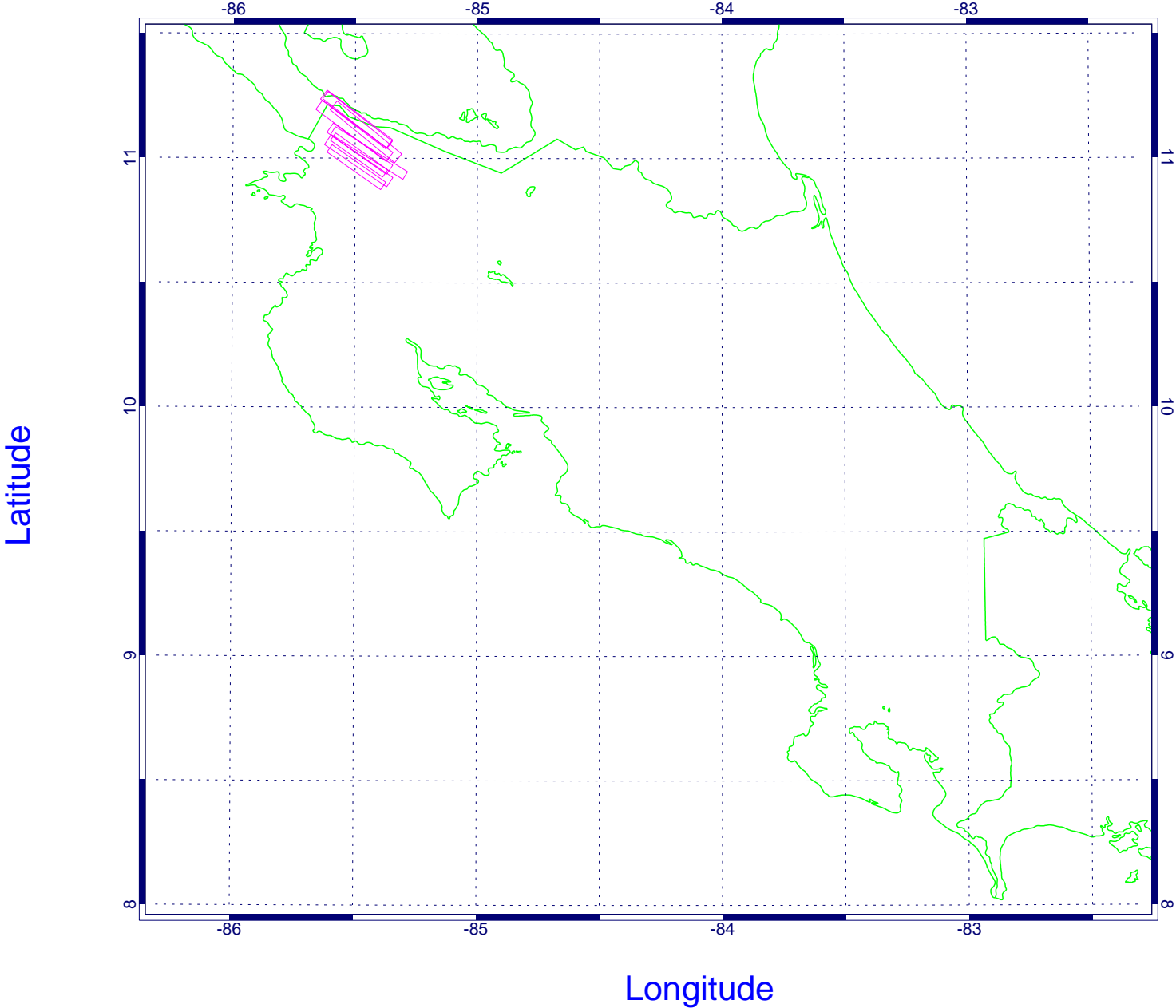
FLTL	SITE	LINE	RUN	START OF FLIGHT LINE			END OF FLIGHT LINE			FLIGHT DATA				
				TIME HH:MM:SS	LAT DEG	LON DEG	TIME HH:MM:SS	LAT DEG	LON DEG	SCAN LINES	SOLAR ZEN	AZIM	HEAD DEG	ALT M (MSL)
1	COC	01	1	15:20:38	5.580	-86.963	15:22:49	5.514	-87.081	3263	38.3	94.2	240.44	3386
2	COC	05	1	15:34:36	5.500	-86.931	15:37:44	5.502	-87.116	4688	34.7	94.9	270.88	3367
3	COC	04	1	15:41:54	5.517	-87.146	15:44:16	5.519	-87.007	3533	33.0	95.3	85.27	3387
4	COC	03	1	15:47:20	5.531	-86.962	15:49:33	5.536	-87.095	3318	31.7	95.6	274.43	3374
5	COC	02	1	15:55:40	5.548	-87.171	15:58:12	5.557	-87.019	3784	29.6	96.2	88.51	3382
6	INO	01	1	17:22:03	11.253	-85.623	17:27:55	11.054	-85.359	8762	11.0	148.0	126.57	2792
7	INO	08	1	17:32:43	10.889	-85.385	17:37:30	11.039	-85.605	7145	9.7	160.1	301.63	2792
8	INO	07	1	17:41:13	11.073	-85.613	17:46:33	10.904	-85.358	7958	9.3	173.2	122.32	2797
9	INO	06	1	17:50:15	10.939	-85.377	17:54:48	11.086	-85.591	6812	9.3	186.5	305.31	2790
10	INO	05	1	17:58:11	11.122	-85.603	18:03:20	10.954	-85.359	7694	9.8	198.7	123.89	2795
11	INO	04	1	18:06:02	10.931	-85.295	18:12:05	11.111	-85.591	9050	10.6	209.7	304.71	2786
12	INO	03	1	18:16:45	11.214	-85.648	18:22:56	11.005	-85.359	9237	12.2	220.4	124.83	2819
13	INO	02	1	18:26:34	11.000	-85.324	18:32:26	11.212	-85.589	8764	13.8	228.5	308.11	2807
14	INO	01	2	18:35:41	11.255	-85.629	18:41:30	11.056	-85.361	8673	15.6	234.0	125.71	2824

NUMBER OF FILES FOR THIS FLIGHT = 14  
 TOTAL NUMBER OF SCAN LINES = 92681  
 DATE THESE FILES WERE PROCESSED = 16-Jun-2003  
 DATE THIS LIST WAS CREATED = Mon Jun 16 14:19:10 PDT 2003  
 GRANULE VERSION = 1

**Data Quality Notice:**

03-003-13: MASTER Port 2, bands 12-25 (1.61 um to 2.38 um) lost liquid nitrogen at 17:50 GMT. Data is not usable for those bands after that time.

MASTER AIRBORNE SIMULATOR 25 Mar 2003, 03-003-13, 9 FLIGHT LINES





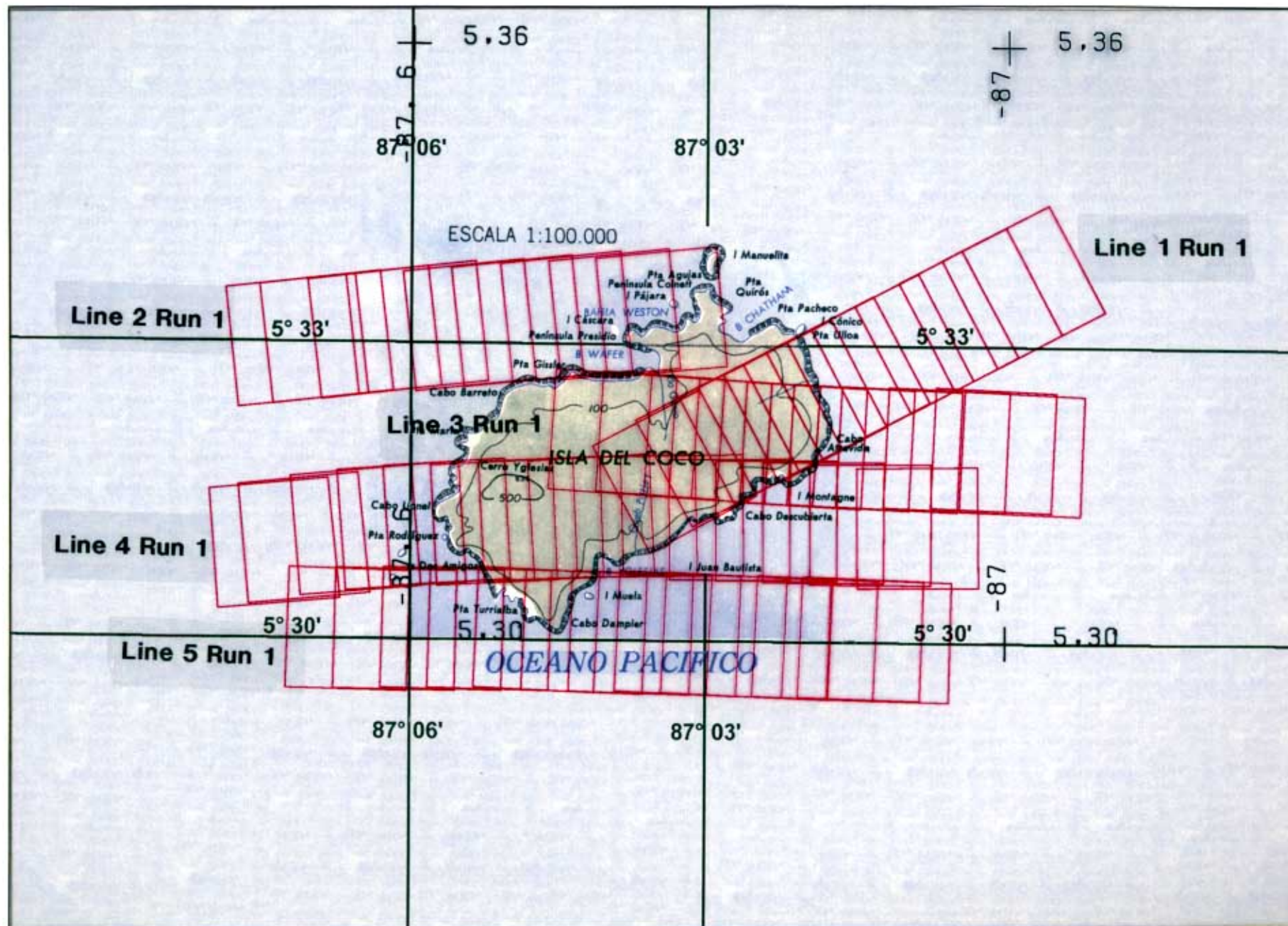
# CAMERA FLIGHT LINE DATA

## FLIGHT NO. 03-003-13

Accession # 05754

Sensor # 034

Site #	Line #	Run #	Frame #	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
				START	END		
COC	1	1	8175-8183	15:21:21	15:22:25	11100/3390	20-50% cumulus, frames 8178-8183
COC	5	1	8184-8196	15:36:10	15:37:43	11100/3390	10-40% cumulus
COC	4	1	8197-8211	15:42:22	15:44:12	11100/3390	10-80% cumulus
COC	3	1	8212-8221	15:48:00	15:49:09	11100/3390	10-80% cumulus
COC	2	1	8222-8230	15:56:35	15:57:37	11100/3390	10-100% cumulus





## FLIGHT SUMMARY REPORT

**Flight Number:** 03-003-14

**Calendar/Julian Date:** 26 March 2003 (085)

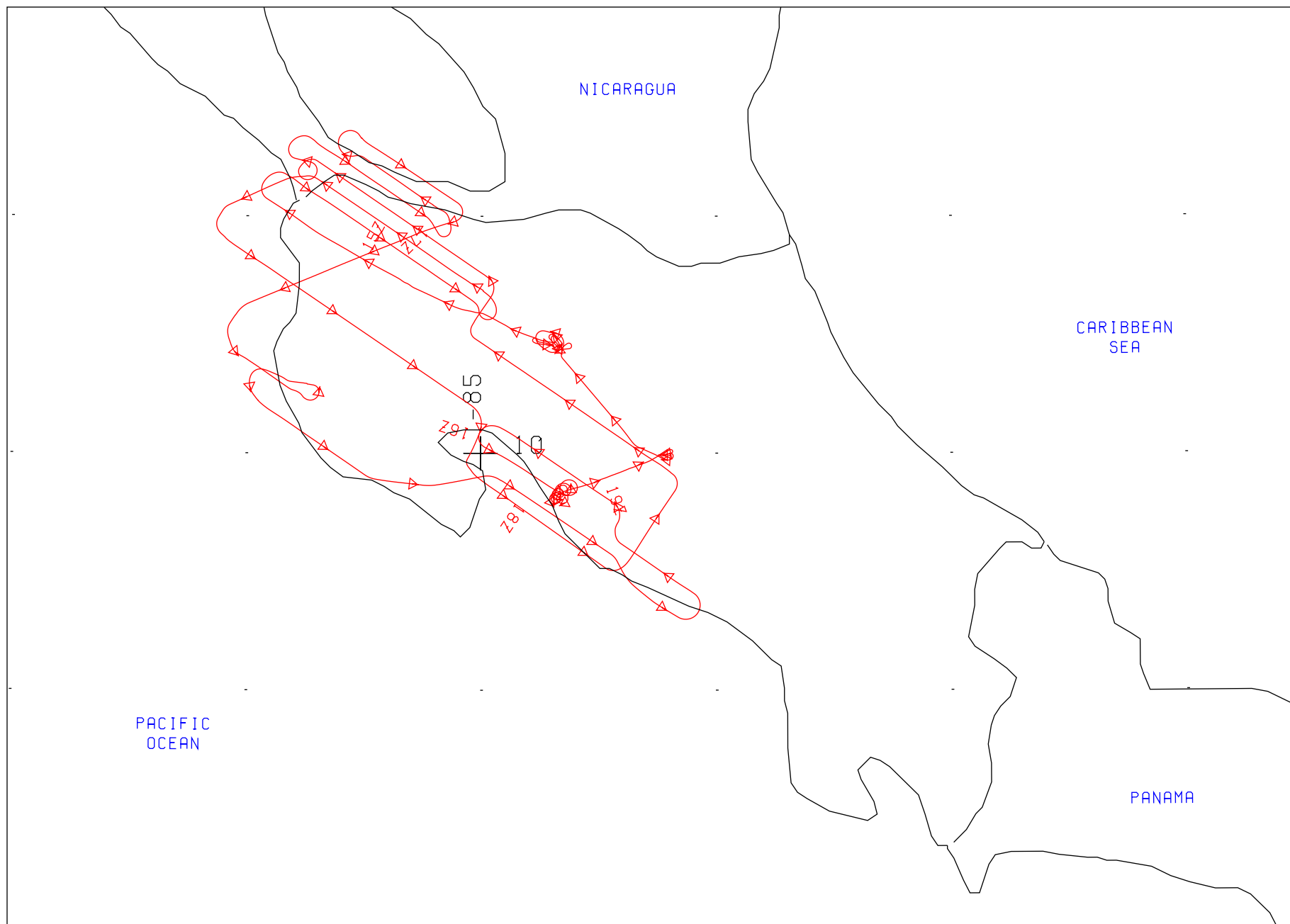
**Sensor Package:** Wild Heerbrugg RC-10  
MODIS/ASTER Airborne Simulator (MASTER)  
Airborne Volcanic Emissions Mass Spectrometer (AVEMS)

**Area(s) Covered:** Costa Rica

**Investigator(s):** Diaz, CENAT      **Aircraft Number:** 926  
NASA JSC WB-57

### SENSOR DATA

<b>Accession #:</b>	05755	-----	-----
<b>Sensor ID #:</b>	076	124	139
<b>Sensor Type:</b>	RC-10	MASTER	AVEMS
<b>Focal Length:</b>	12" 304.89 mm	-----	-----
<b>Film Type:</b>	Aerochrome IR SO-734	-----	-----
<b>Filtration:</b>	Wratten 12	-----	-----
<b>Spectral Band:</b>	510-900 nm	-----	-----
<b>f-Stop:</b>	11	-----	-----
<b>Shutter Speed:</b>	1/350	-----	-----
<b># of Frames:</b>	201	-----	-----
<b>% Overlap:</b>	60	-----	-----
<b>Quality:</b>	Excellent	-----	-----
<b>Remarks:</b>	Subtract 7 seconds for correct UTC		



FLIGHT 03-003-14

26 MARCH 2003

A/C 926

MASTER / RC-10

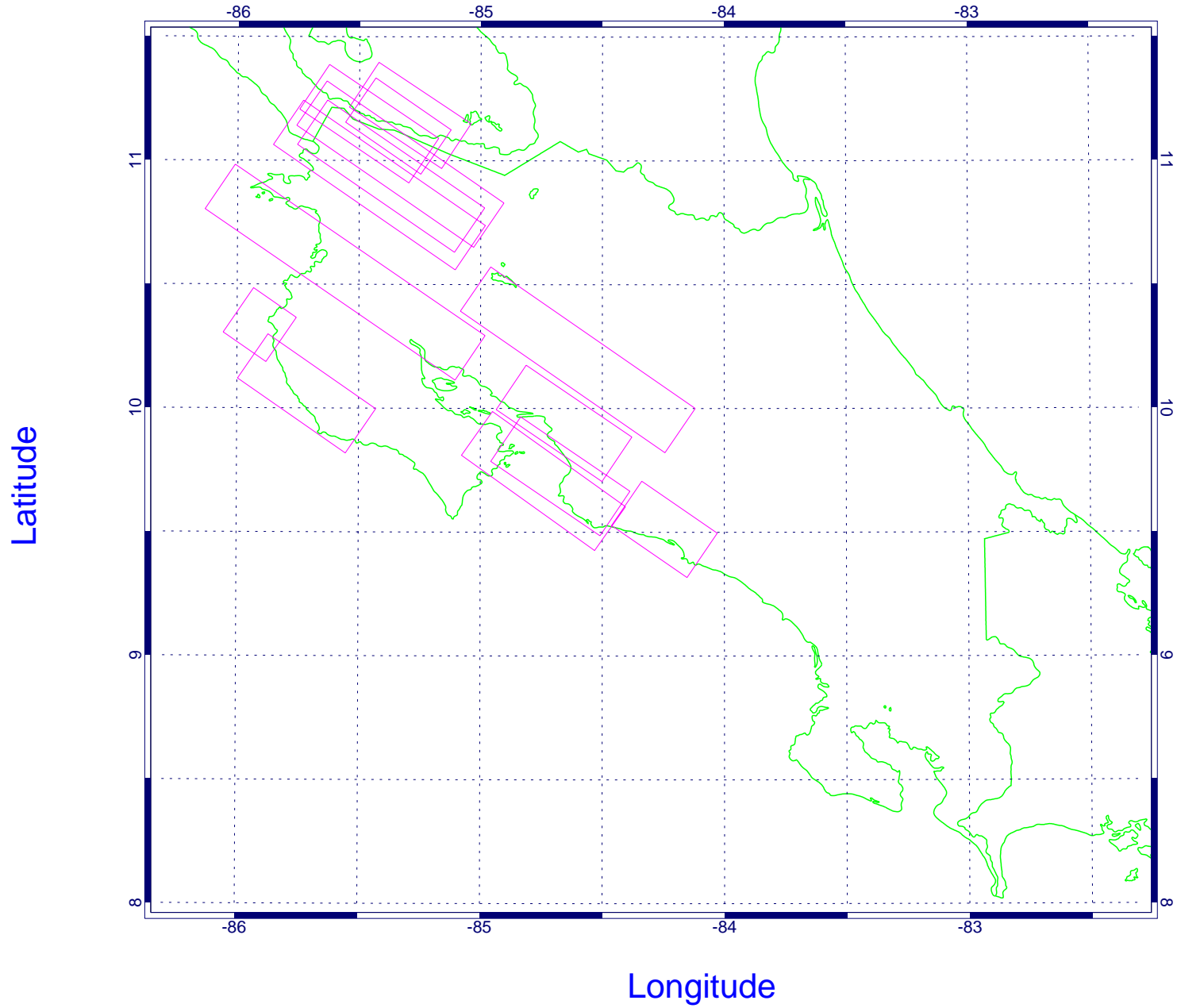
MODIS/ASTER AIRBORNE SIMULATOR (MASTER) FLIGHT LINE INFORMATION  
 FOR 26 Mar 2003  
 NASA FLIGHT NUMBER 03-003-14

FLTL	SITE	LINE	RUN	START OF FLIGHT LINE			END OF FLIGHT LINE			FLIGHT DATA				
				TIME HH:MM:SS	LAT DEG	LON DEG	TIME HH:MM:SS	LAT DEG	LON DEG	SCAN LINES	SOLAR ZEN	AZIM	HEAD DEG	ALT M (MSL)
1	CRT	17	6	15:09:05	11.153	-85.792	15:20:45	10.649	-85.043	4350	38.9	100.2	125.92	13808
2	CRT	18	5	15:25:14	10.720	-85.046	15:35:17	11.154	-85.693	3749	35.2	102.0	301.42	13763
3	CRT	11	3	15:43:21	10.893	-86.072	15:58:15	10.204	-85.043	5561	30.3	104.0	129.45	13787
4	CRT	7A	4	16:02:56	9.899	-85.014	16:10:55	9.515	-84.468	2983	25.5	105.6	126.62	13785
5	CRT	15	4	16:17:10	9.911	-84.181	16:31:08	10.482	-85.021	5219	21.5	110.7	298.75	13786
6	CRT	19	3	16:34:47	10.740	-84.967	16:45:55	11.231	-85.696	4168	18.8	116.8	301.03	13787
7	CRT	20	4	16:53:00	11.297	-85.685	16:59:46	11.000	-85.235	2528	15.6	124.2	127.96	13773
8	CRT	21	3	17:03:37	11.035	-85.185	17:08:24	11.244	-85.495	1791	13.6	130.4	297.69	13765
9	CRT	22	2	17:12:25	11.306	-85.481	17:17:50	11.059	-85.101	2029	12.0	138.1	126.91	13787
10	CRT	05	2	17:35:01	10.395	-85.995	17:37:25	10.276	-85.819	903	8.8	157.5	124.48	13788
11	CRT	03	2	17:45:24	10.209	-85.935	17:51:49	9.908	-85.492	2400	7.9	179.6	128.07	13789
12	CRT	08	4	17:58:57	9.876	-84.896	18:05:18	9.576	-84.448	2380	8.7	209.9	124.73	13786
13	CRT	09	3	18:12:27	9.407	-84.091	18:17:11	9.617	-84.400	1779	10.8	227.7	300.44	13788
14	CRT	11	4	18:19:33	9.795	-84.440	18:25:57	10.085	-84.874	2402	12.2	231.3	300.78	13713

NUMBER OF FILES FOR THIS FLIGHT = 14  
 TOTAL NUMBER OF SCAN LINES = 42242  
 DATE THESE FILES WERE PROCESSED = 09-Jun-2003  
 DATE THIS LIST WAS CREATED = Mon Jun 9 16:08:40 PDT 2003  
 GRANULE VERSION = 1



MASTER AIRBORNE SIMULATOR 26 Mar 2003, 03-003-14, 14 FLIGHT LINES



# CAMERA FLIGHT LINE DATA

## FLIGHT NO. 03-003-14

Accession # 05755

Page 1 of 2

Sensor # 076

Site #	Line #	Run #	Frame #	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
				START	END		
CRT	17	6	5631-5655	15:10:12	15:20:16	45200/13780	10-40% cumulus, frames 5640-5655
CRT	18	5	5656-5681	15:24:45	15:35:14	45100/13750	10-60% cumulus, frames 5656-5673; 10-30% cumulus, frames 5675-5681
CRT	11	3	5682-5716	15:44:03	15:58:13	45200/13780	10-20% cumulus, frames 5701-5704; 10-50% cumulus, frames 5706-5716
CRT	7A	2	5717-5724	16:07:59	16:10:53	45200/13780	Minor-40% cumulus
CRT	15	4	5725-5729	16:29:04	16:30:43	45200/13780	30-70% cumulus
CRT	19	3A	5730-5736	16:35:16	16:37:23	45200/13780	40-50% cumulus
CRT	19	3B	5737-5753	16:39:25	16:45:38	45100/13750	20-60% cumulus
CRT	20	4	5754-5769	16:53:29	16:59:36	45200/13780	10-60% cumulus
CRT	21	3	5770-5779	17:04:20	17:07:41	45200/13780	Minor-40% cumulus, frames 5770-5777
CRT	22	2	5780-5785	17:15:59	17:17:41	45200/13780	10-30% cumulus, frames 5783-5785
CRT	5A	2	5786-5792	17:35:14	17:37:01	45200/13780	Minor-10% cumulus

# CAMERA FLIGHT LINE DATA

## FLIGHT NO. 03-003-14

Accession # 05755

Page 2 of 2

Sensor # 076

Site #	Line #	Run #	Frame #	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
				START	END		
CRT	3A	2A	5793-5802	17:46:04	17:49:23	45200/13780	10-70% cumulus
CRT	3A	2B	5803-5805	17:51:13	17:51:43	45200/13780	40-50% cumulus
CRT	8	3	5806-5813	18:02:13	18:05:01	45200/13780	20-70% cirrus and cumulus
CRT	9	3	5814-5824	18:13:27	18:17:09	45200/13780	10-60% cirrus and cumulus
CRT	11	4	5825-5831	18:21:21	18:23:27	45200/13780	10-80% cumulus

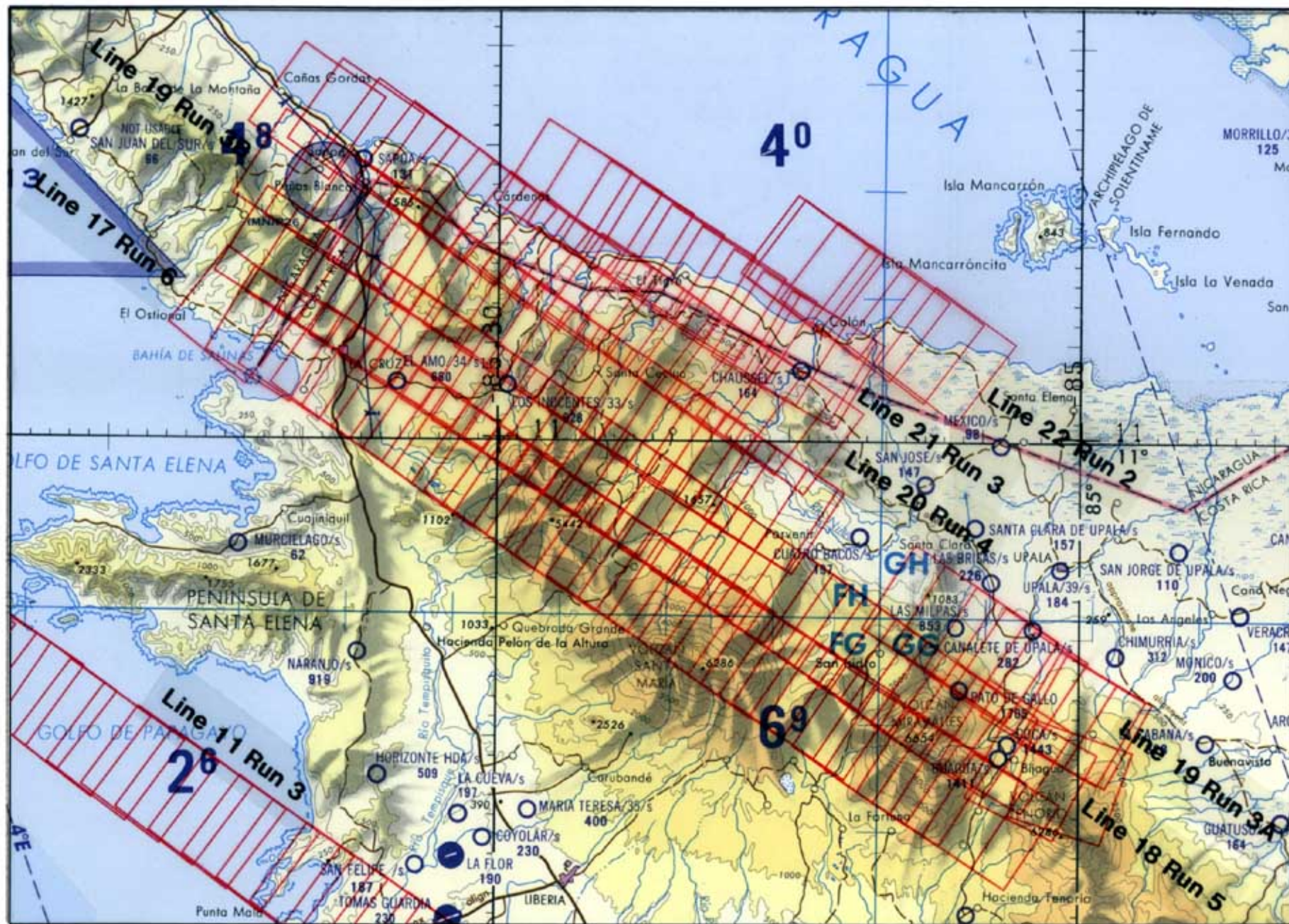












FLIGHT 03-003-14

26 MARCH 2003

A/C 926(JSC WB-57)

RC-10





FLIGHT 03-003-14

26 MARCH 2003

R/C 926(JSC WB-57)

RC-10

## FLIGHT SUMMARY REPORT

**Flight Number:** 03-003-15

**Calendar/Julian Date:** 27 March 2003 (086)

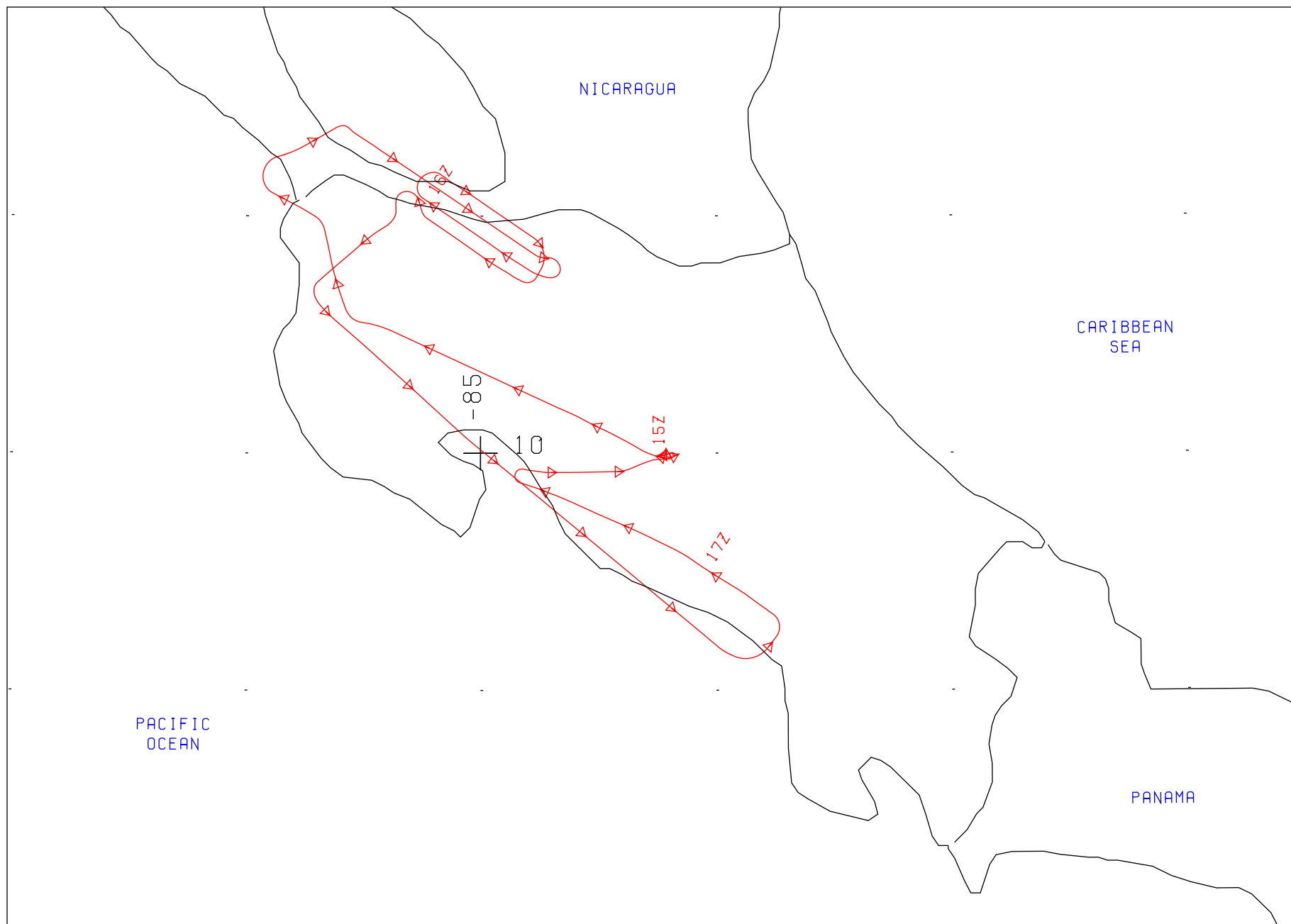
**Sensor Package:** Wild Heerbrugg RC-10  
MODIS/ASTER Airborne Simulator (MASTER)  
Airborne Volcanic Emissions Mass Spectrometer (AVEMS)

**Area(s) Covered:** Costa Rica

**Investigator(s):** Diaz, CENAT      **Aircraft Number:** 926  
NASA JSC WB-57

### SENSOR DATA

<b>Accession #:</b>	05756	-----	-----
<b>Sensor ID #:</b>	076	124	139
<b>Sensor Type:</b>	RC-10	MASTER	AVEMS
<b>Focal Length:</b>	12" 304.66 mm	-----	-----
<b>Film Type:</b>	Aerochrome IR SO-734	-----	-----
<b>Filtration:</b>	Wratten 12	-----	-----
<b>Spectral Band:</b>	510-900 nm	-----	-----
<b>f-Stop:</b>	11	-----	-----
<b>Shutter Speed:</b>	1/350	-----	-----
<b># of Frames:</b>	49	-----	-----
<b>% Overlap:</b>	60	-----	-----
<b>Quality:</b>	Excellent	-----	-----
<b>Remarks:</b>	Subtract 3 seconds for correct UTC		



FLIGHT 03-003-15

27 MARCH 2003

A/C 926

MASTER / RC-10

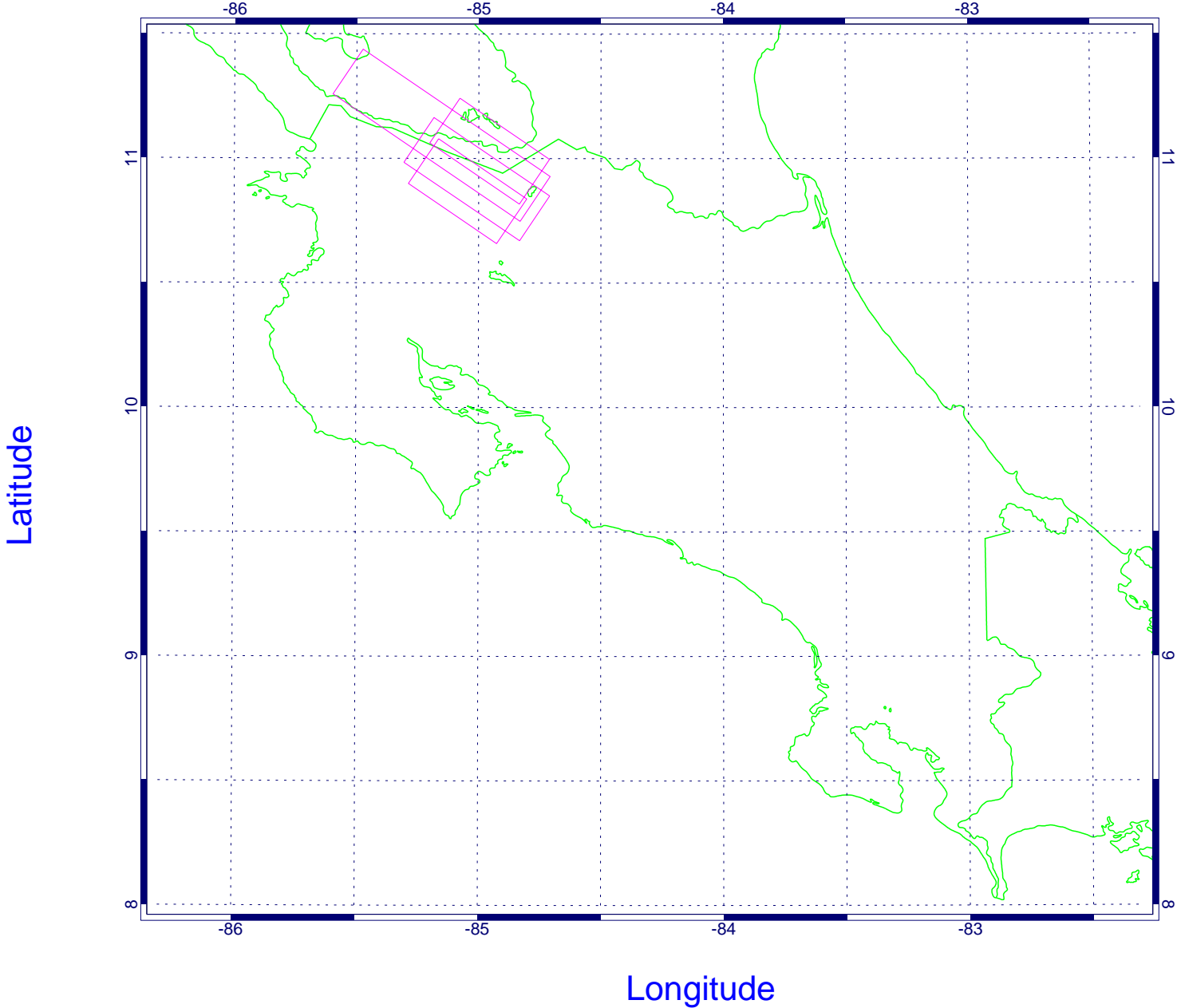


MODIS/ASTER AIRBORNE SIMULATOR (MASTER) FLIGHT LINE INFORMATION  
 FOR 27 Mar 2003  
 NASA FLIGHT NUMBER 03-003-15

FLTL	SITE	LINE	RUN	START OF FLIGHT LINE			END OF FLIGHT LINE			FLIGHT DATA				
				TIME HH:MM:SS	LAT DEG	LON DEG	TIME HH:MM:SS	LAT DEG	LON DEG	SCAN LINES	SOLAR ZEN	AZIM	HEAD DEG	ALT M (MSL)
1	CRT	22	3	15:37:23	11.348	-85.536	15:49:21	10.838	-84.769	4468	31.7	103.4	126.33	13818
2	CRT	21	4	15:52:59	10.760	-84.771	16:00:32	11.074	-85.245	2819	28.3	105.2	296.82	13788
3	CRT	23	3	16:03:33	11.152	-85.139	16:09:21	10.907	-84.772	2167	26.0	107.2	126.30	13821
4	CRT	20	5	16:13:18	10.748	-84.865	16:18:44	10.989	-85.226	2031	23.8	108.8	300.39	13821

NUMBER OF FILES FOR THIS FLIGHT = 4  
 TOTAL NUMBER OF SCAN LINES = 11485  
 DATE THESE FILES WERE PROCESSED = 10-Jun-2003  
 DATE THIS LIST WAS CREATED = Tue Jun 10 11:41:04 PDT 2003  
 GRANULE VERSION = 1

MASTER AIRBORNE SIMULATOR 27 Mar 2003, 03-003-15, 4 FLIGHT LINES



# CAMERA FLIGHT LINE DATA

## FLIGHT NO. 03-003-15

Accession # 05756

Sensor # 034

Site #	Line #	Run #	Frame #	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
				START	END		
CRT	22	3	8247-8262	15:43:01	15:49:18	45200/13780	20-50% cumulus
CRT	21	4	8263-8276	15:54:32	15:59:59	45200/13780	40-60% cumulus
CRT	23	3	8277-8283	16:06:37	16:09:07	45500/13870	40-50% cumulus
CRT	20	5	8284-8295	16:14:02	16:18:37	45200/13780	40-70% cumulus





## FLIGHT SUMMARY REPORT

**Flight Number:** 03-003-16

**Calendar/Julian Date:** 29 March 2003 (088)

**Sensor Package:** Wild Heerbrugg RC-10  
MODIS/ASTER Airborne Simulator (MASTER)  
Airborne Volcanic Emissions Mass Spectrometer (AVEMS)

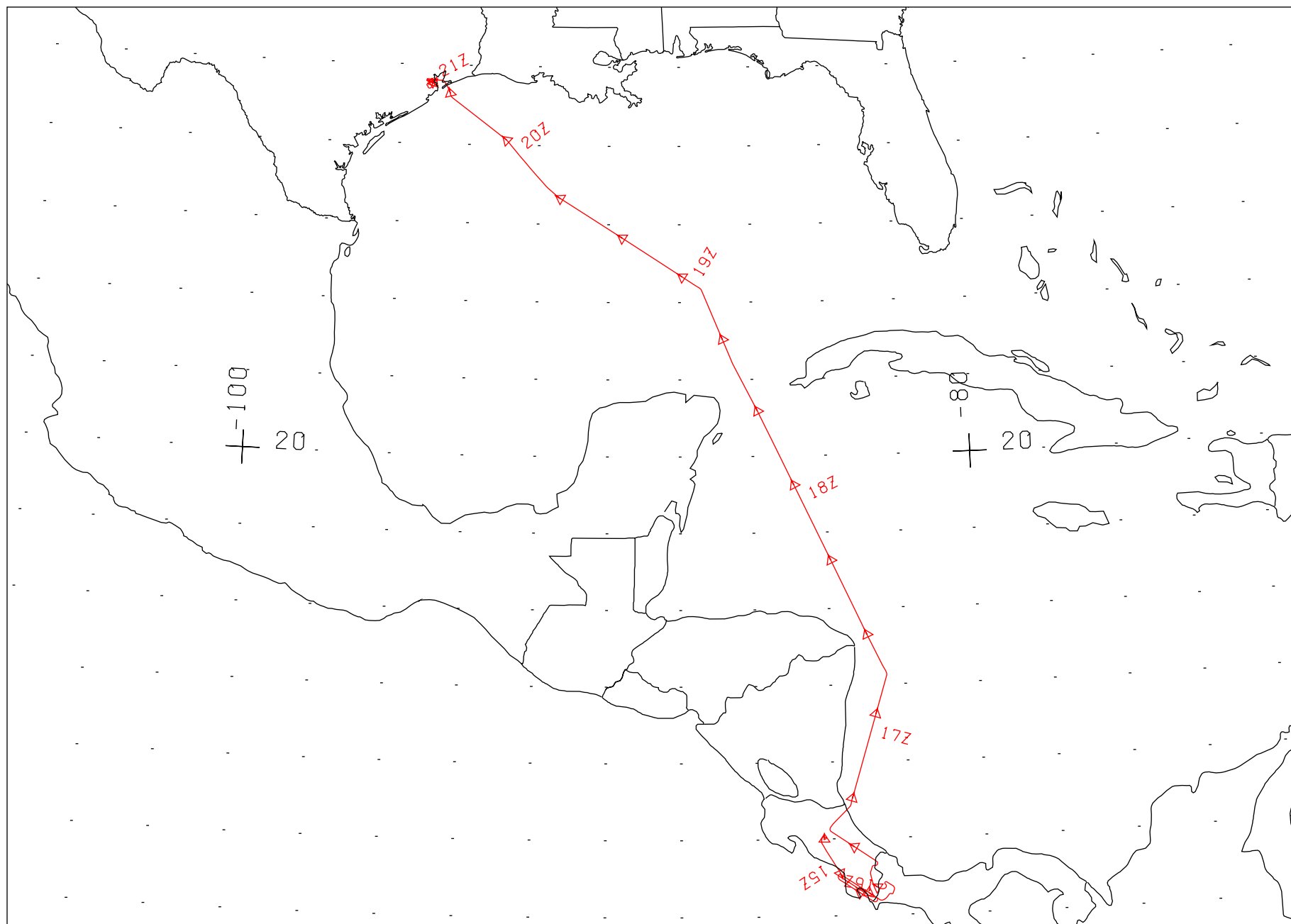
**Area(s) Covered:** Costa Rica/Caribbean Sea/Gulf of Mexico/Houston, TX

**Investigator(s):** Diaz, CENAT  
Ferry to Houston, TX

**Aircraft Number:** 926  
NASA JSC WB-57

### SENSOR DATA

<b>Accession #:</b>	05757	-----	-----
<b>Sensor ID #:</b>	076	124	139
<b>Sensor Type:</b>	RC-10	MASTER	AVEMS
<b>Focal Length:</b>	12" 304.66 mm	-----	-----
<b>Film Type:</b>	Aerochrome IR SO-734	-----	-----
<b>Filtration:</b>	Wratten 12	-----	-----
<b>Spectral Band:</b>	510-900 nm	-----	-----
<b>f-Stop:</b>	11	-----	-----
<b>Shutter Speed:</b>	1/350	-----	-----
<b># of Frames:</b>	116	-----	-----
<b>% Overlap:</b>	60	-----	-----
<b>Quality:</b>	Excellent	-----	-----
<b>Remarks:</b>	Subtract 5 seconds for correct UTC		



FLIGHT 03-003-16

29 MARCH 2003

A/C 926

MASTER / RC-10

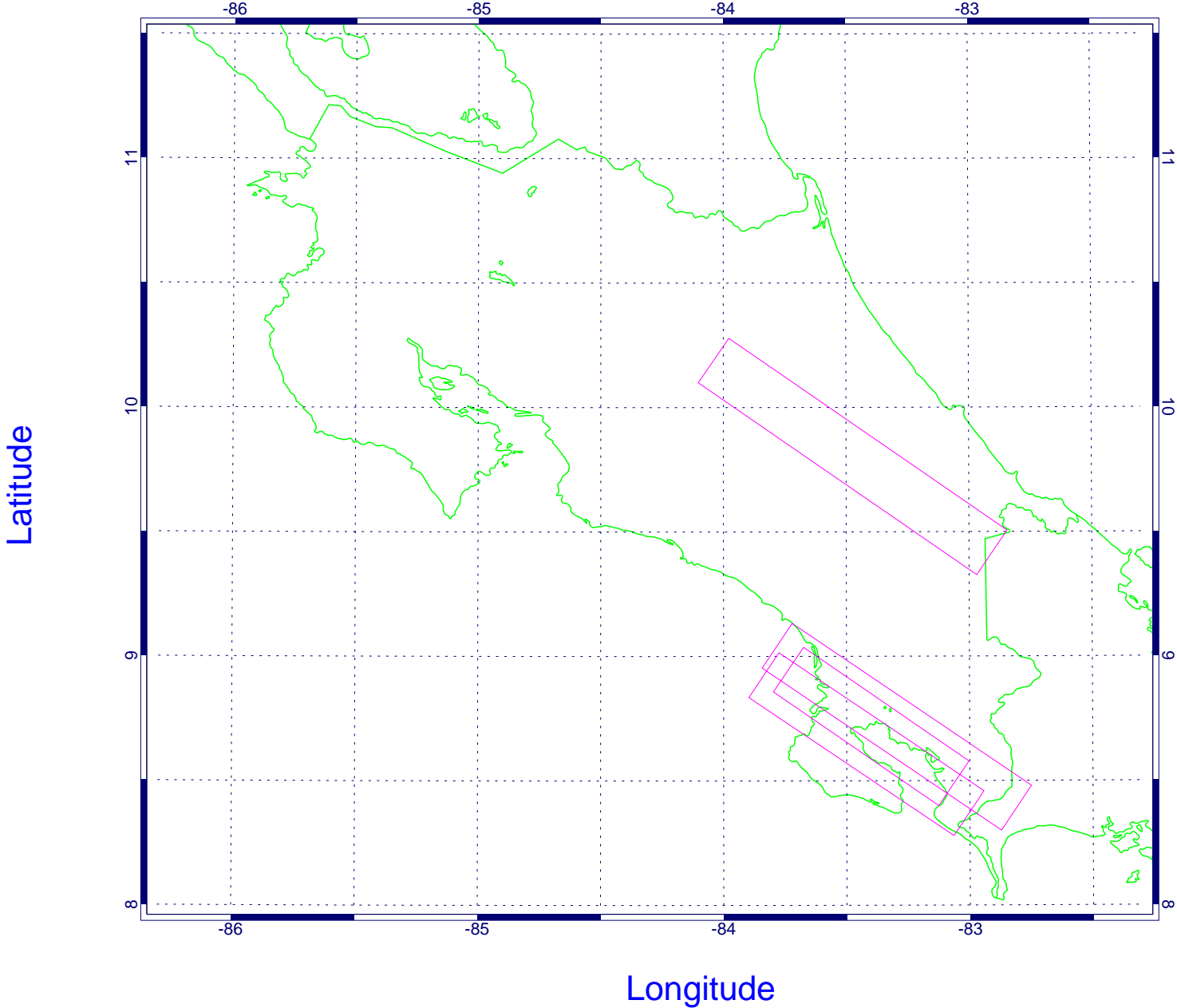


MODIS/ASTER AIRBORNE SIMULATOR (MASTER) FLIGHT LINE INFORMATION  
 FOR 29 Mar 2003  
 NASA FLIGHT NUMBER 03-003-16

FLTL	SITE	LINE	RUN	START OF FLIGHT LINE			END OF FLIGHT LINE			FLIGHT DATA				
				TIME HH:MM:SS	LAT DEG	LON DEG	TIME HH:MM:SS	LAT DEG	LON DEG	SCAN LINES	SOLAR ZEN	AZIM	HEAD DEG	ALT M (MSL)
1	CRT	6B	3	15:06:50	8.947	-83.736	15:15:40	8.489	-83.065	3296	37.0	96.1	126.72	13778
2	CRT	5B	3	15:20:27	8.369	-83.004	15:32:11	8.925	-83.836	4381	33.4	97.2	302.38	13720
3	CRT	7B	5	15:35:06	9.043	-83.782	15:48:55	8.390	-82.811	5159	29.4	98.8	125.74	13859
4	CRT	20	6	16:15:54	9.416	-82.907	16:34:22	10.189	-84.040	6908	19.5	108.4	303.10	13767
5	CAR	04	1	16:43:48	10.921	-83.494	17:10:31	13.842	-82.585	9999	13.9	133.5	10.87	15141
6	CAR	04	2	17:10:31	13.842	-82.585	17:13:54	14.210	-82.468	1265	12.1	151.5	13.13	15221
7	CAR	02	5	17:14:48	14.309	-82.473	17:41:30	16.935	-83.731	9999	12.8	168.3	332.81	15296
8	CAR	02	6	17:41:30	16.935	-83.731	17:58:03	18.563	-84.518	6202	14.6	187.8	331.33	15251
9	CAR	02	7	17:58:03	18.564	-84.518	18:24:44	21.165	-85.815	9999	17.7	200.8	330.22	15249
10	GOM	06	1	18:24:45	21.165	-85.815	18:51:25	23.667	-87.053	9999	22.3	212.3	329.25	15289
11	GOM	06	2	18:51:25	23.667	-87.053	18:58:14	24.312	-87.345	2555	25.3	217.8	326.36	15225
12	GOM	07	1	18:58:51	24.359	-87.384	19:25:31	25.693	-89.637	9999	27.9	221.8	297.83	15115
13	GOM	07	2	19:25:31	25.693	-89.638	19:44:53	26.666	-91.350	7260	31.1	226.5	294.97	15100
14	GOM	08	1	19:45:06	26.676	-91.368	19:52:12	27.155	-91.938	2664	33.0	228.8	301.17	15085
15	GOM	09	1	19:52:12	27.155	-91.938	20:04:34	28.111	-92.877	4633	34.6	230.2	305.74	15167
16	GOM	10	1	20:04:41	28.120	-92.887	20:16:08	28.805	-93.917	4288	36.5	231.8	297.11	15162
17	EFD	01	1	20:31:27	29.605	-94.824	20:41:33	29.607	-95.231	3788	40.7	236.2	254.39	9456
18	FRW	01	1	20:48:11	29.643	-95.095	20:53:21	29.494	-95.226	1935	43.2	239.7	225.38	9476

NUMBER OF FILES FOR THIS FLIGHT = 18  
 TOTAL NUMBER OF SCAN LINES = -22391  
 DATE THESE FILES WERE PROCESSED = 11-Jun-2003  
 DATE THIS LIST WAS CREATED = Thu Jun 12 09:28:43 PDT 2003  
 GRANULE VERSION = 1

MASTER AIRBORNE SIMULATOR 29 Mar 2003, 03-003-16, 4 FLIGHT LINES



# CAMERA FLIGHT LINE DATA

## FLIGHT NO. 03-003-16

Accession # 05757

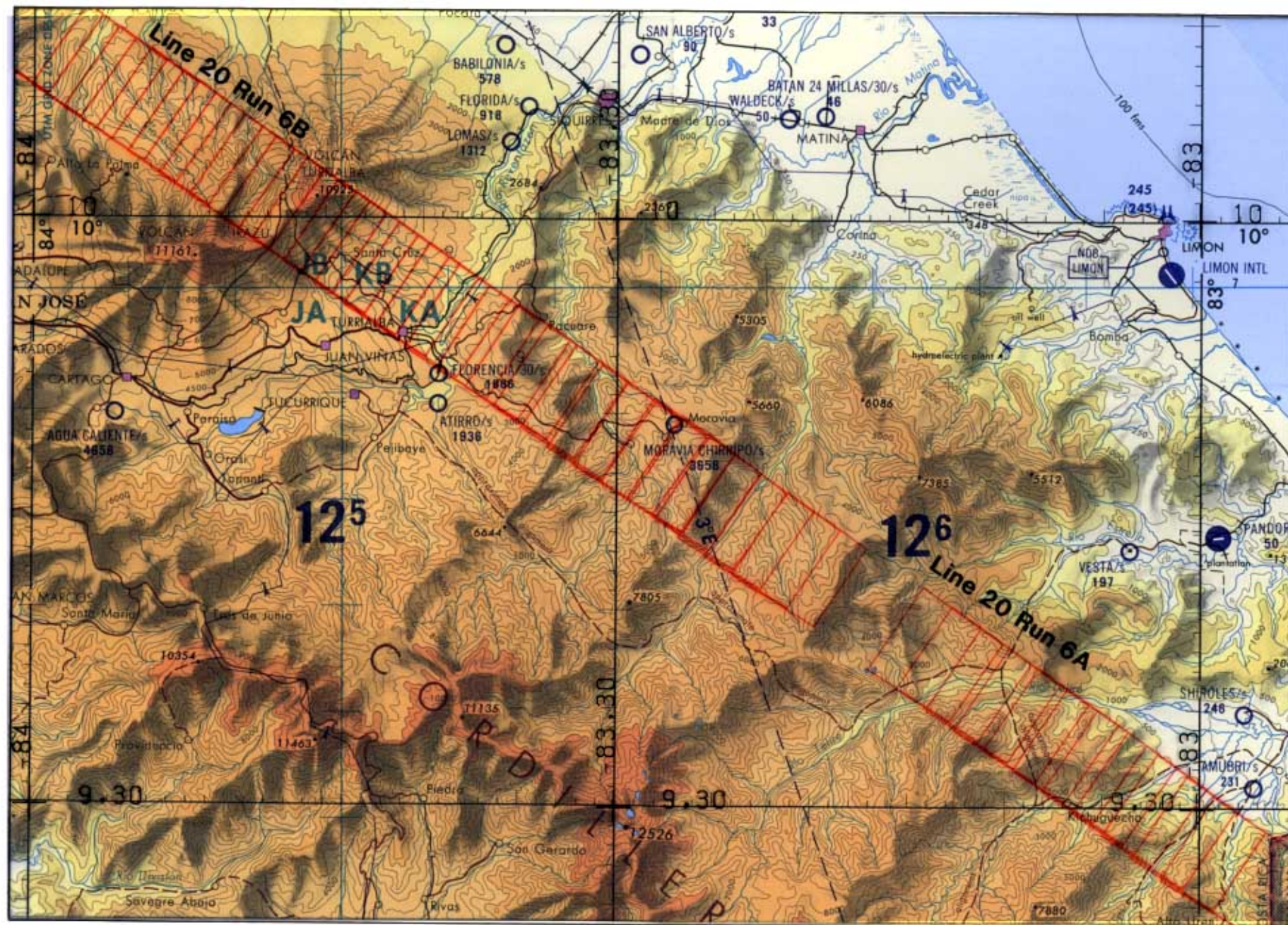
Sensor # 034

Site #	Line #	Run #	Frame #	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
				START	END		
CRT	6B	2	8299-8316	15:08:27	15:15:36	45100/13750	10-40% cumulus
CRT	5B	1	8317-8334	15:23:04	15:30:12	45000/13720	Minor-10% cumulus, frames 8320-8323; 10-50% cumulus, frames 8325-8333
CRT	7B	3A	8335-8349	15:37:11	15:43:03	45400/13840	10-50% cumulus
CRT	7B	3B	8350-8358	15:45:28	15:48:49	45500/13870	10-50% cumulus
CRT	20	6A	8359-8369	16:16:50	16:20:58	45200/13780	10-30% cumulus
CRT	20	6B	8370-8396	16:22:59	16:33:43	45200/13780	Minor-30% cumulus, frames 8370-8382; minor-40% cumulus, frames 8387-8396
EFT	1	1	8397-8405	20:37:50	20:40:44	31000/9450	Clear, Ellington Field, TX
JSC	1	1	8406-8408	20:43:32	20:44:01	31000/9450	Clear, NASA JSC
FRW	1	1	8409-8414	20:51:02	20:52:44	31100/9480	Clear, Friendswood, TX









FLIGHT 03-003-16

29 MARCH 2003

A/C 926(JSC WB-57)

RC-10



