FLIGHT SUMMARY REPORT

Flight #: 92-063

Date: 21 February 1992

Sensor Package: Stormfest Instructment Package
Wild-Heerbrug RC-10
Modis-N Airborne Simulator (MAS)
Advanced Microwave Precipitation Radiometer (AMPR)
Lightning Instrument Package (LIP)
Microwave Thermal Sampler (MTS)
High-Resolution Interferometer Sounder (HIS)

Area(s) Covered: Gulf of Mexico, Western Florida, and Louisiana

Investigator(s): Heymsfield, NASA-GSFC **Aircraft #:** 706

Flight Request: 2P22029 **Julian Date:** 052

SENSOR DATA

Accession #:	04378	-----	-----	-----	-----	-----
Sensor ID #:	036	108	105	106	110	083
Sensor Type:	RC-10	MAS	AMPR	LIP	MTS	HIS
Focal Length:	6" 153.19 mm	-----	-----	-----	-----	-----
Film Type:	Panatomic-X Aerographic II 2412	-----	-----	-----	-----	-----
Filtration:	2.2 AV, Wratten 12	-----	-----	-----	-----	-----
Spectral Band:	510-700 nm	-----	-----	-----	-----	-----
f Stop:	5.6	-----	-----	-----	-----	-----
Shutter Speed:	1/300	-----	-----	-----	-----	-----
# of Frames:	204	-----	-----	-----	-----	-----
% Overlap:	60	-----	-----	-----	-----	-----
Quality:	Excellent	Good	-----	-----	-----	-----

Remarks:

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 sensors and camera system(s) used for data collection during this flight.

Modis-N Airborne Simulator

The Modis-N Airborne Simulator (MAS) is a modified Daedalus multispectral scanner. It records up to 12 8-bit channels, which can be selected from an array of 50 available spectral bands. The band selection is made prior to flight and the instrument is hard-wired to that configuration. Channel one can be used to store additional bits which provide 10-bit resolution for channels 9 through 12. The band configuration for the Stormfest deployment is as follows:

Channel	Band edges µm
1	-----
2	0.675 - 0.685
3	1.605 - 1.655
4	1.955 - 2.005
5	3.675 - 3.825
6	4.325 - 4.575
7	4.575 - 4.725
8	9.000 - 9.400
9*	9.400 - 9.800
10*	9.800 - 10.200
11*	10.700 - 11.200
12*	12.200 - 12.700

* 10-bit resolution

Sensor/Aircraft Parameters:

Spectral Channels:	50
Output Channels:	7 8-bit and 4 10-bit
IFOV:	0.5 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.)

Advanced Microwave Precipitation Radiometer

The Advanced Microwave Precipitation Radiometer (AMPR) is a scanning passive microwave radiometer operating at frequencies of 10, 19, 37, and 85 GHz. The AMPR is configured to fit into the Q-bay of the ER-2 and scans cross-track +/- 45° to the left and right of nadir. The instrument's principle use is for gathering microwave image data of cloud water and precipitation primarily over the ocean. Some data collected also will be used for studies of vegetation, ground moisture, sea surface state, and snow cover. The AMPR is sponsored by Dr. Roy W. Spencer, NASA-MSFC, ES43, Huntsville, Alabama 35812, FTS 824-1686.

Lightning Instrument Package

The Lightning Instrument Package (LIP) comprises a set of optical and electrical sensors with a wide range of temporal, spatial, and spectral resolution to observe lightning and investigate electrical environments within and above thunderstorms. The instruments provide measurements of the air conductivity and vertical electric field above thunderstorms and provide estimates of the storm electric currents. In addition, LIP will detect total storm lightning and differentiate between intracloud and cloud-to-ground discharges. This data will be used in studies of lightning/storm structure and lightning precipitation relationships. The LIP is sponsored by Dr. Richard Blakeslee, NASA-MSFC, ES43, Huntsville, Alabama 35812, FTS 824-1651.

MIT Millimeter-wave Temperature Sounder

The Millimeter-wave Temperature Sounder (MTS) is a dual-band microwave radiometer system for the measurement of atmospheric temperature and other phenomena affecting transmission in the microwave absorption bands of molecular oxygen. MTS data has been used to produce images of temperature and precipitation structure, to infer precipitation cell top altitudes and to detect atmospheric waves.

The instrument is capable of either downward- or upward-viewing operation on the ER-2 as well as ground-based operation. One radiometer is an eight channel scanning spectrometer with its radiometer centered on the 118,75 GHz oxygen line. The second radiometer is a single-channel (Ch. 0) nadir (or zenith) viewing system with its local oscillator tunable under computer control from 52 th 54 GHz. Characteristics of the two radiometers are as follows:

Channel	Center freq. (MHz)	Width (MHz)
	Single Channel Radiometer	
0	115	170
Channel	**Center freq. (MHz)**	**Width (MHz)**
	Eight Channel Radiometer	
1	660	170
2	840	210
3	1040	240
4	1260	220

5	1470	240
6	1670	220
7	1900	270
8	500	125

For further information contact Michael Schwarz, Massachusetts Institute of Technology, MIT-RLE Mail Stop 26-357, 77 Massachusetts Ave., Cambridge, MA 02139.

High-Resolution Interferometer Sounder

The High-Resolution Interferometer Sounder (HIS) measures upwelling infrared spectral radiance at the aircraft altitude with high absolute accuracy using a passive Michelson interferometer and precision onboard blackbody calibration sources. The instrument has a single nadir staring field of view with observed spectra obtained every six seconds. The spectra cover the range 16.6 microns to 3.3 microns with a spectral resolution of 0.3 to 0.5 cm^{-1}. The primary use of the instrument is as an atmospheric sounder of temperature and water vapor. The spectra also contain important information on trace gases and surface properties. The HIS was developed by the University of Wisconsin at Madison and is a prototype instrument for advanced infrared satellite sounders.

Camera Systems

Various camera systems and films are used for photographic data collection. Film types include high definition color infrared, natural color, and black and white emulsions. Available photographic systems are as follows:

- Wild-Heerbrug RC-10 metric mapping camera
  - 9 x 9 inch film format
  - 6 inch focal length lens provides area coverage of 16 x 16 nautical miles from 65,000 feet
  - 12 inch focal length lens provides area coverage of 8 x 8 nautical miles from 65,000 feet

- Hycon HR-732 large scale mapping camera
  - 9 x 18 inch film format
  - 24 inch focal length lens provides area coverage of 4 x 8 nautical miles from 65,000 feet

- IRIS II Panoramic camera
  - 4.5 x 34.7 inch film format
  - 24 inch focal length lens
  - 90 degree field of view provides area coverage of 2 x 21.4 nautical miles from 65,000 feet

The U.S. Geological Survey's EROS Data Center at Sioux Falls, South Dakota serves as the archive and product distribution facility for NASA-Ames aircraft acquired photographic and digital imagery. For information regarding photography and digital data (including areas of coverage, products, and product costs) contact EROS Data Center, Customer Services, Sioux Falls, South Dakota 57198 (Telephone: (605) 594-6151).

Additional information regarding ER-2 acquired photographic and digital data is available through the Aircraft Data Facility at Ames Research Center. For specific information regarding flight documentation, sensor parameters, and areas of coverage contact the Aircraft Data Facility, NASA-Ames Research Center, Mail Stop 240-6, Moffett Field, California 94035-1000 (Telephone: (415) 604-6252).

CAMERA FLIGHT LINE DATA
FLIGHT NO. 92-063

Accession # 04378

Sensor # 036

Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
A - B	0006-0048	19:08:17	19:47:44	65000/19800	100% cloud cover
B - C	0049-0052	19:48:40	19:51:29	"	100% cloud cover; oblique frames in turn (frames 0049, 0051-0052)
C - D	0053-0055	19:52:25	19:54:17	"	100% cloud cover
D - E	0056-0059	19:55:13	19:58:02	"	100% cloud cover; oblique (frames 0056 and 0059)
E - F	0060-0073	19:58:58	20:11:07	"	100% cloud cover
F - G	0074-0077	20:12:03	20:14:51	"	100% cloud cover; oblique frames in turn
G - H	0078-0090	20:15:47	20:26:59	"	100% cloud cover; oblique (frame 0090)
H - B	0091-0093	20:27:55	20:29:47	"	100% cloud cover
B- I	0094-0098	20:30:43	20:34:27	"	100% cloud cover; oblilque (frames 0094-0095 and 0097-0098)

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Sensor # 036

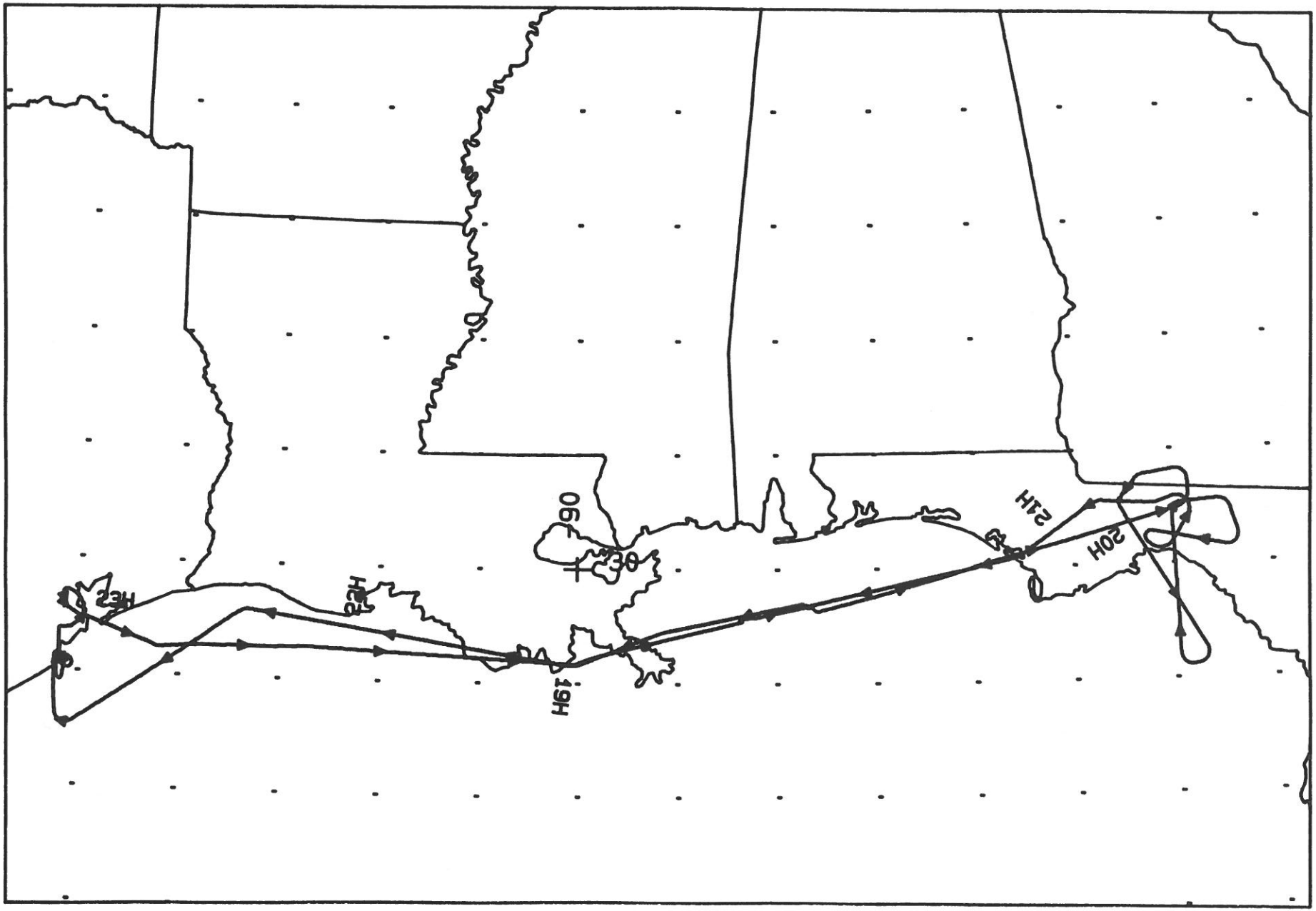
Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
I - J	0099-0105	20:35:23	20:40:58	65000/19800	100% cloud cover
____	0106-0109	20:41:54	20:44:42	"	100% cloud cover; oblique (frames 0106, 0108-0109)
J - K	0110-0111	20:45:38	20:46:34	"	100% cloud cover
K - C	0112-0116	20:47:30	20:51:14	"	100% cloud cover; oblique (frames 0112-0114; 0116)
C - E	0117-0120	20:52:10	20:54:57	"	100% cloud cover
____	0121-0122	20:55:53	20:56:49	"	100% cloud cover; oblique frames in turn
E - L	0123-0130	20:57:45	21:04:16	"	100% cloud cover
L - A	0131-0162	21:05:12	21:34:03	"	100% cloud cover; oblique (frame 0162)
A - M	0163-0170	21:34:59	21:41:29	"	100% cloud cover; oblique (frame 0170)
M - N	0171-0191	21:42:25	22:01:01	"	40-100% cloud cover; oblique (frame 0171)
N - O	0192-0209	22:10:01	22:25:46	"	100% cloud cover

MAS SCANNER FLIGHT LINE DATA

FLIGHT NO. 92-063

DAEDALUS FLIGHT DATA
FLIGHT NUMBER: 92-063

Check Points	Actual time (GMT) begin	end	Actual scanline begin	end	Altitude feet/meter	Scan Speed (rps)	total Good scanlines	total Interpolated scanlines	total Repeated scanlines
A-B	19:08:10.0	19:47:49.0	29251	44061	65000/19812	6.25	14801	0	10
C-D	19:52:38.0	19:54:47.0	45861	46661	65000/19812	6.25	801	0	0
D-E	19:56: 7.0	19:57:12.0	47163	47565	65000/19812	6.25	401	0	2
E-F	19:59: 4.0	20:11:24.0	48265	52871	65000/19812	6.25	4601	0	6
G-H	20:16:31.0	20:25:59.0	54783	58315	65000/19812	6.25	3501	1	31
H-B	20:28: 8.0	20:30: 0.0	59117	59819	65000/19812	6.25	701	0	2
I-J	20:35:54.0	20:40:59.0	62021	63921	65000/19812	6.25	1901	0	0
J-K	20:45:16.0	20:47: 9.0	65521	66221	65000/19812	6.25	701	0	0
C-E	20:51:58.0	20:55:45.0	68021	69433	65000/19812	6.25	1401	0	12
E-L	20:57:37.0	21:02:58.0	70133	72133	65000/19812	6.25	2001	0	0
L-I	21:05:39.0	21:28:10.0	73133	81543	65000/19812	6.25	8401	0	10
I-A	21:28:42.0	21:32:44.0	81743	83251	65000/19812	6.25	1501	0	8
A-M	21:34:26.0	21:41:32.0	83881	86538	65000/19812	6.25	2601	0	57
M-N	21:43:25.0	22:01: 7.0	87240	93850	65000/19812	6.25	6601	0	10
O-P	22:11: 3.0	22:25:47.0	97558	103060	65000/19812	6.25	5501	0	2



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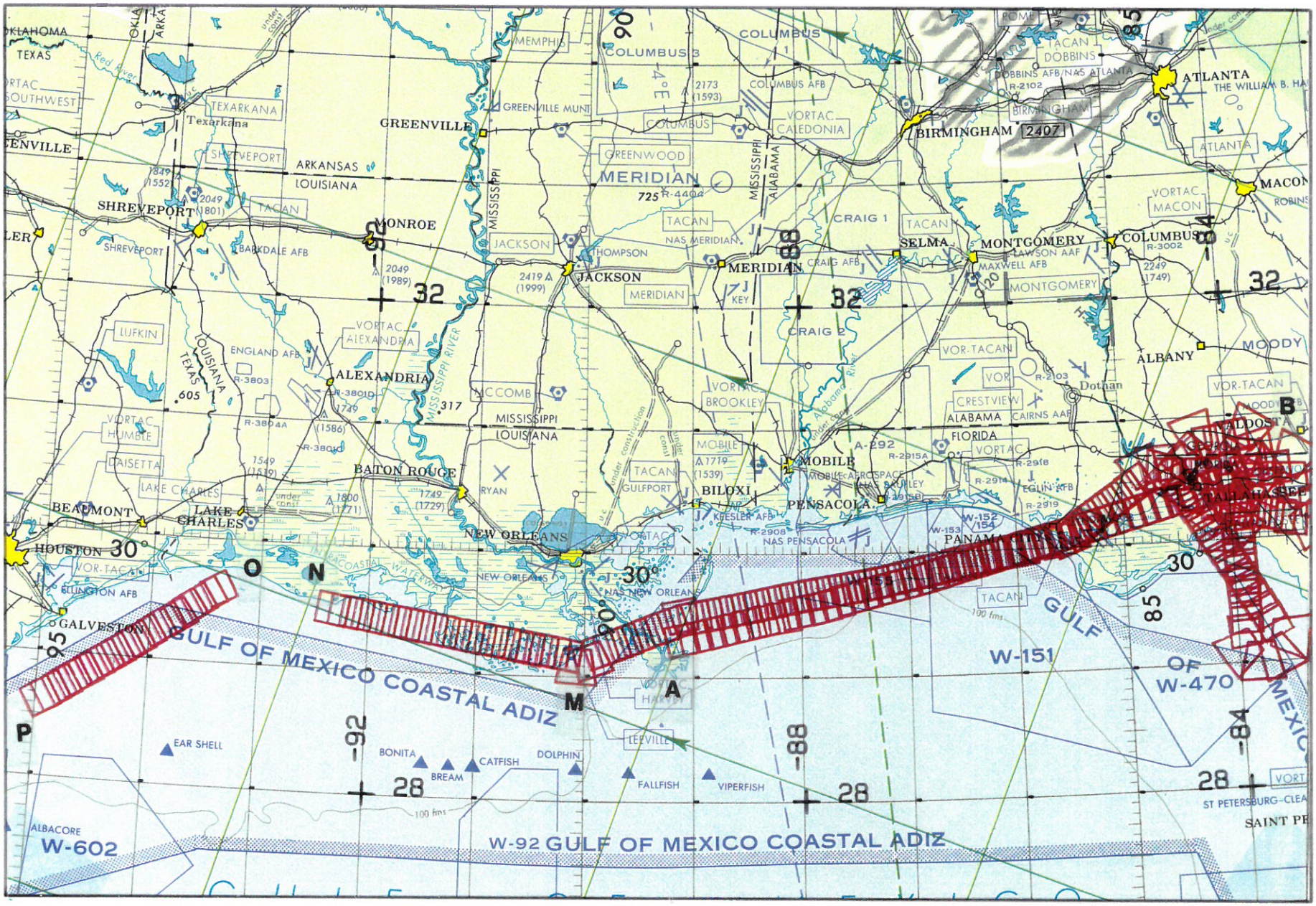

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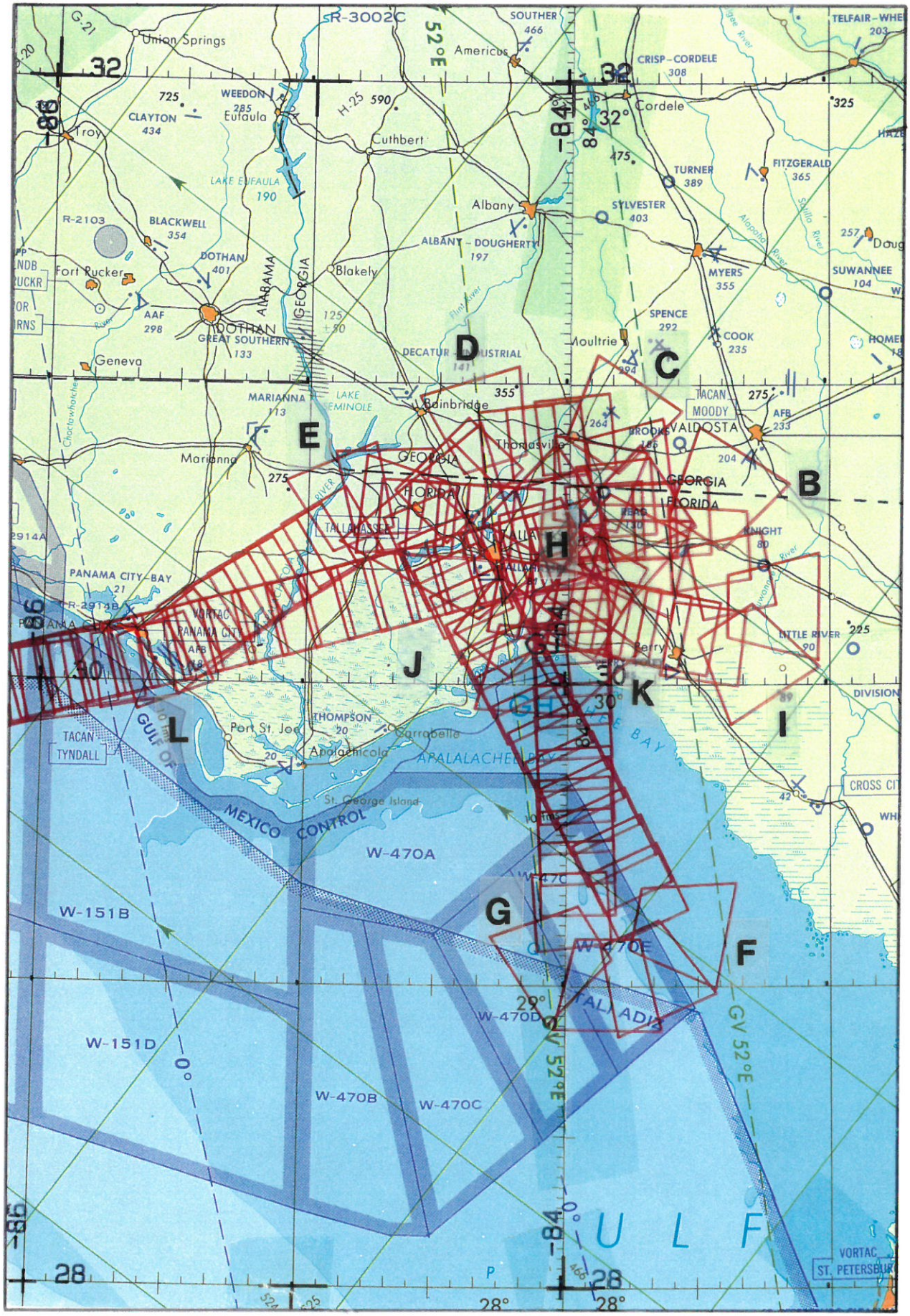

FLIGHT 92-063 21 February 1992 A/C 706 RC-10 2412 Accession # 04378 JNC 43