

FLIGHT SUMMARY REPORT

Flight Number: 93-130
Calendar/Julian Date: 05 July 1993 • 186
Sensor Package: Wild-Heerbrug RC-10
 Airborne Visible and Infrared Imaging Spectrometer (AVIRIS)
 Modis Airborne Simulator (MAS)
 Electro-Optic Camera System (EOC)
Area(s) Covered: New England

Investigator(s): Aber, U. of New Hampshire

Aircraft #: 708

SENSOR DATA

Accession #:	04584	-----	-----	-----
Sensor ID #:	034	099	108	111
Sensor Type:	RC-10	AVIRIS	MAS	EOC
Focal Length:	12" 304.66 mm	-----	-----	-----
Film Type:	High Definition Aerochrome IR SO-131	-----	-----	-----
Filtration:	cc.10B	-----	-----	-----
Spectral Band:	510-900 nm	-----	-----	-----
f Stop:	4	-----	-----	-----
Shutter Speed:	1/150	-----	-----	-----
# of Frames:	98	-----	-----	-----
% Overlap:	60	-----	-----	-----
Quality:	Good	-----	Fair	-----
Remarks:	Filter wrinkled, data blurred, camera clock offset 10.15 seconds from navigation data		Data offset 10.07 minutes from navigation data	

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

Airborne Visible and Infrared Imaging Spectrometer

The Airborne Visible and Infrared Imaging Spectrometer (AVIRIS) is the second in the series of imaging spectrometer instruments developed at the Jet Propulsion Laboratory (JPL) for earth remote sensing. This instrument uses scanning optics and four spectrometers to image a 614 pixel swath simultaneously in 224 contiguous spectral bands (0.4-2.4 μm).

AVIRIS parameters are as follows:

IFOV:	1 mrad
Ground Resolution:	66 feet (20 meters) at 65,000 feet
Total Scan Angle:	30°
Swath Width:	5.7 nmi (10.6 km) at 65,000 feet
Spectral Coverage:	0.41-2.45 μm
Pixels/Scan Line:	614
Number of Spectral Bands:	224
Digitization:	10-bits
Data Rate:	17 MBPS

<u>Spectrometer</u>	<u>Wavelength Range</u>	<u>Number of Bands</u>	<u>Sampling Interval</u>
1	0.41 - 0.70 μm	31	9.4 nm
2	0.68 - 1.27 μm	63	9.4 nm
3	1.25 - 1.86 μm	63	9.7 nm
4	1.84 - 2.45 μm	63	9.7 nm

All AVIRIS data is decommutated and archived at JPL and not currently available for public distribution. For further information contact Rob Green at Jet Propulsion Laboratory, 4800 Oak Grove Drive, Mail Stop 183-501, Pasadena, California 91109-8099.

Modis Airborne Simulator

The Modis 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 following MAS band combination (configuration SCARP1) was used on this flight for Smoke, Cloud, and Radiation (SCAR) experiments:

<u>Data System Channel</u>	<u>MAS Channel</u>	<u>Band edges μm</u>
1	--	-----
2	1	0.529 - 0.572
3	2	0.635 - 0.688
4	7	0.852 - 0.893
5	9	0.926 - 0.969
6	15	1.855 - 1.905
7	20	2.126 - 2.173
8	31	3.659 - 3.810
9*	42	8.342 - 8.738
10*	45	10.791 - 11.239
11*	48	13.023 - 13.375
12*	46	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:

<u>CCD Video Camera</u>	
IFOV:	0.2 mrad
Ground Resolution:	15.8 feet (4.81 meters at 65,000 feet)
Total Scan Angle:	13.96°
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° 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.

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. 93-130**

Accession # 04584

Sensor # 034

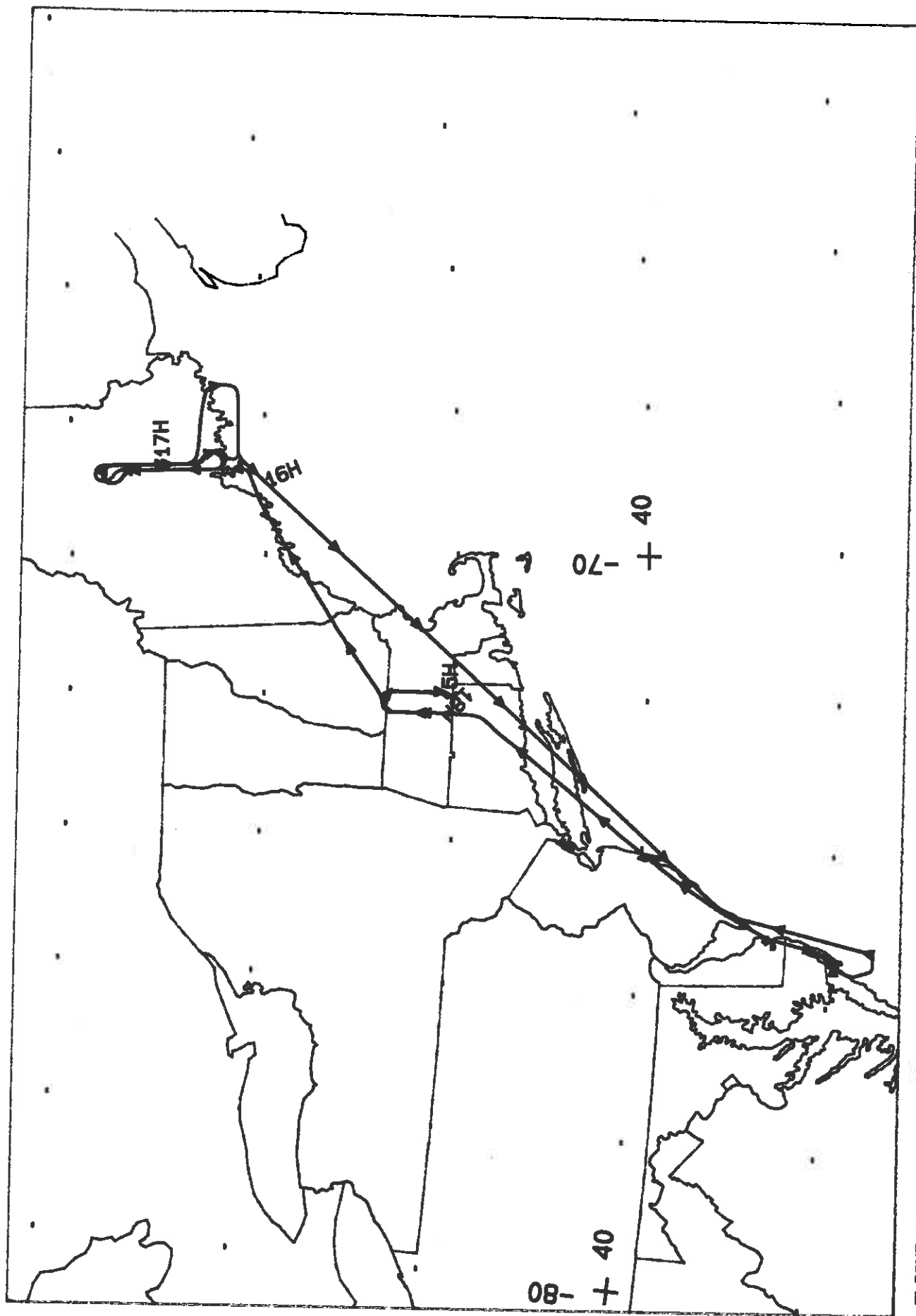
Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
A - B	8674-8679	14:52:42	14:55:05	65000/19800	10-20% scattered cumulus
A - B	8680-8686	15:07:06	15:09:58	"	10-20% scattered cumulus
A - B	8687-8693	15:21:54	15:24:45	"	10-20% scattered cumulus
C - D	8694-8705	15:56:23	16:01:37	"	Clear
E - F	8706-8717	16:09:48	16:15:01	"	Clear
C - D	8718-8729	16:22:37	16:27:51	"	Clear
E - F	8730-8741	16:35:03	16:40:17	"	Clear
C - D	8742-8753	16:47:09	16:52:24	"	Clear
E - F	8754-8765	16:59:23	17:04:37	"	Clear
G - H	8766-8771	17:18:21	17:20:43	"	Clear

MAS SCANNER FLIGHT LINE DATA

FLIGHT NO. 93-130

DALDALUS FLIGHT DATA
FLIGHT NUMBER: 93-130

Check Points	A c t u a l t i m e b e g i n	A c t u a l t i m e e n d	A c t u a l s c a n n i n g b e g i n	A c t u a l s c a n n i n g e n d	A l t i t u d e f e e t / m e t e r	Scan S p e e d (pps)	T o t a l b o d s c a n l i n e s	T o t a l I n t e r p o l a t e d s c a n l i n e s	T o t a l R e p e a t e d s c a n l i n e s
A-B	14:47:59.0	14:53:18.0	45045	50401	65000/19812	12.50	457	0	0
A-B	15:07:43.0	15:10:14.0	59707	61266	65000/19812	12.50	1881	1	0
A-B	15:20:47.0	15:25:25.0	69503	72775	65000/19812	12.50	3466	0	0
C-D	15:53:08.0	16:03:18.0	93763	101366	65000/19812	12.50	7623	1	0
E-F	16:08:19.0	16:15:52.0	105143	110374	65000/19812	12.50	5743	0	0
C-D	16:21:39.0	16:28:47.0	115147	120493	65000/19812	12.50	5346	1	0
E-F	16:59:20.0	16:41:20.0	124651	127700	65000/19812	12.50	5050	0	0
C-D	16:43:49.0	16:55:13.0	133264	138808	65000/19812	12.50	5544	1	0
E-F	16:58:47.0	17:04:30.0	142387	147520	65000/19812	12.50	4554	0	0
G-H	17:16:30.0	17:20:56.0	155935	158598	65000/19812	12.50	3664	0	0

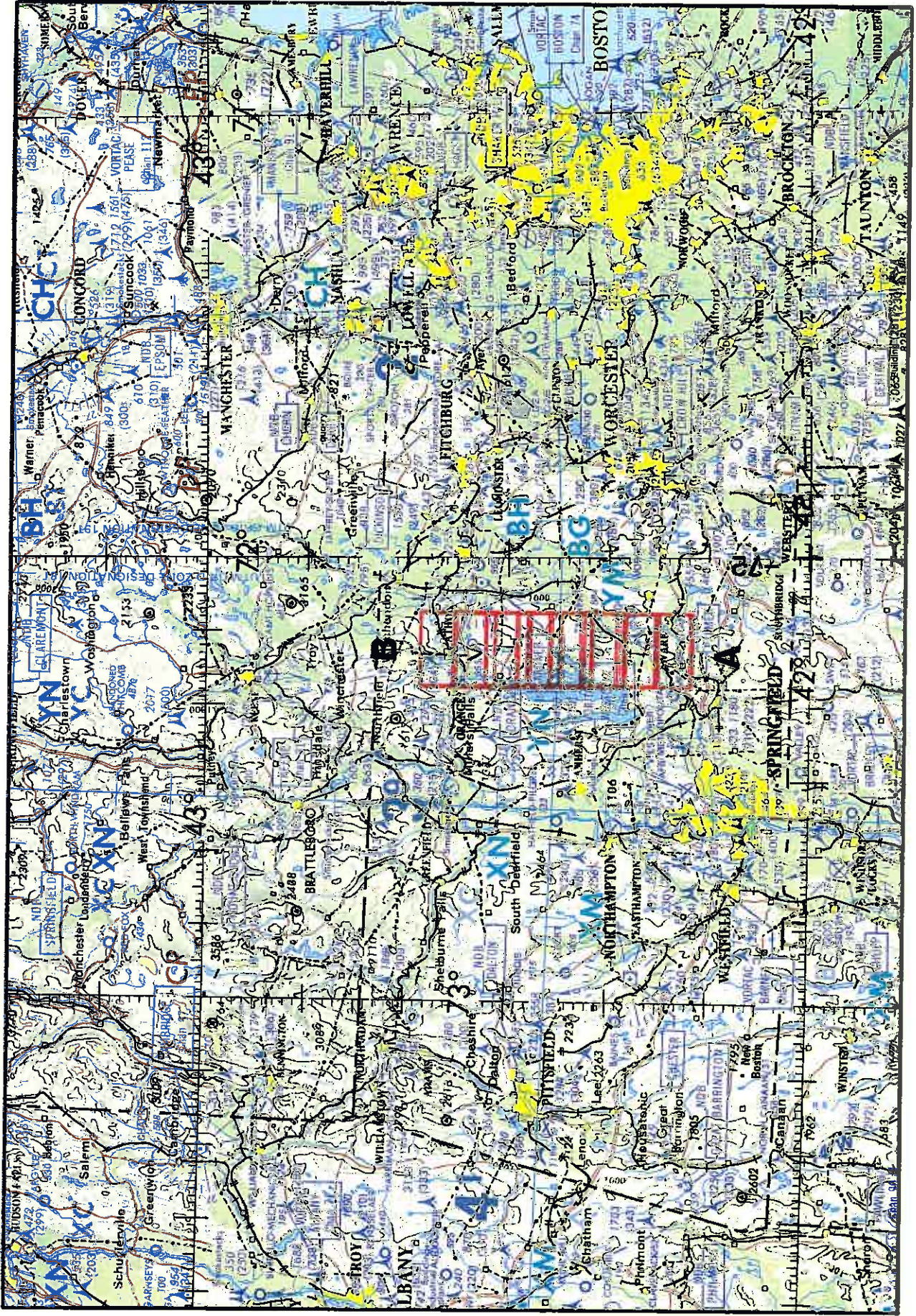


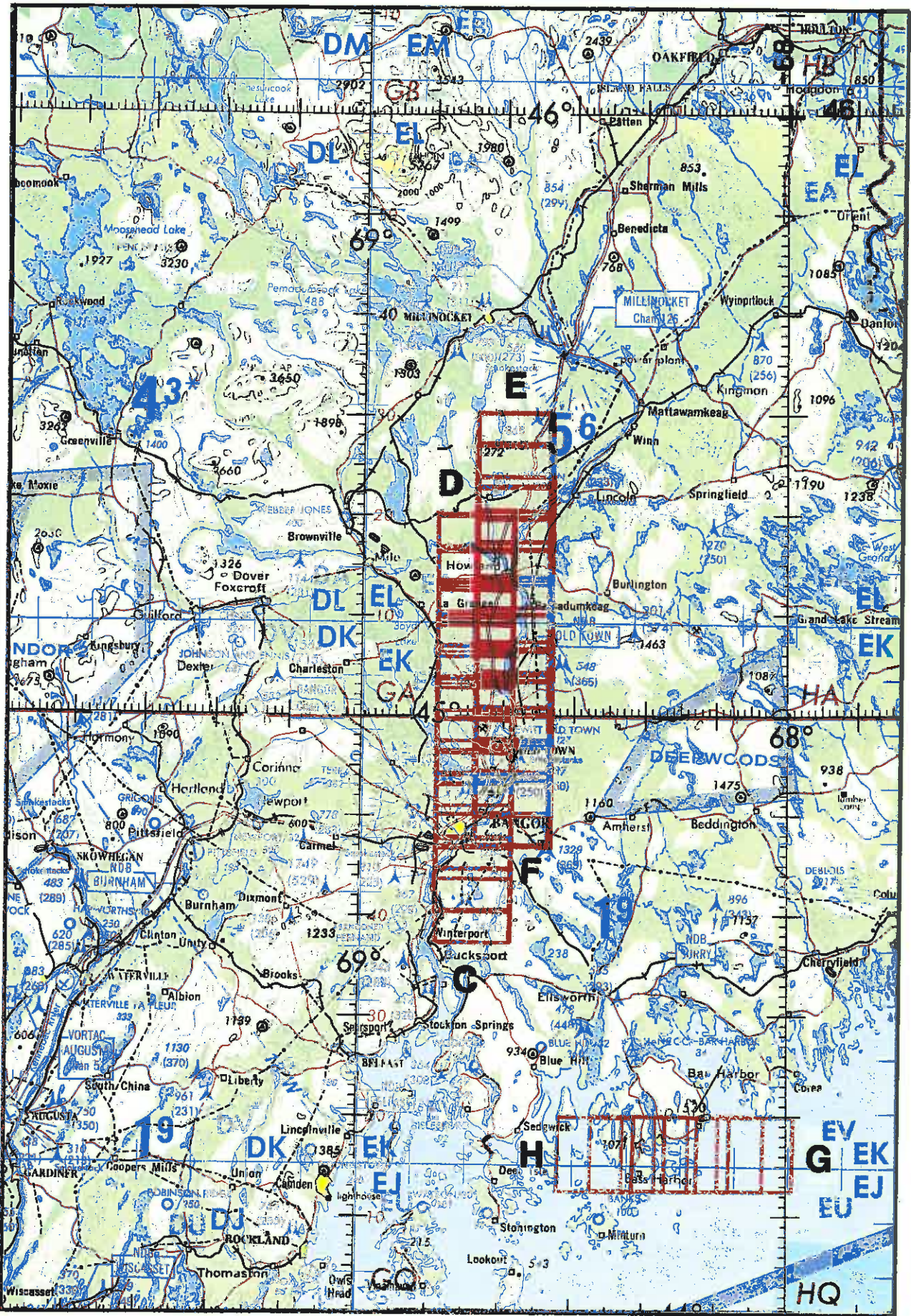
FLIGHT 93-130

5 JULY 1993

A/C 708

AVIRIS / RC-10 / MAS / EOC





ONC F-19

RC-10 / AVTRIS / MAS / EOC

A/C 708

5 JULY 1993

FLIGHT 89-190