

FLIGHT SUMMARY REPORT

Flight Number: 93-086
Calendar/Julian Date: 20 April 1993 • 110
Sensor Package: Wild-Heerbrug RC-10
Modis-N Airborne Simulator (MAS)
Thematic Mapper Simulator (TMS)
Area(s) Covered: Sierra Nevada

Investigator(s): Westerman, LMSC

Aircraft #: 708

SENSOR DATA

Accession #:	04555	-----	-----
Sensor ID #:	076	108	074
Sensor Type:	RC-10	MAS	TMS
Focal Length:	12" 304.89 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:	120	-----	-----
% Overlap:	60	-----	-----
Quality:	Excellent	Fair	Good
Remarks:	Camera clock offset 6.0 seconds 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.

Thematic Mapper Simulator

The Daedalus Thematic Mapper Simulator (TMS) is a multispectral scanner flown aboard the ER-2 aircraft which simulates spatial and spectral characteristics of the seven Landsat-D Thematic Mapper bands. The specific bands are as follows:

<u>Daedalus Channel</u>	<u>TM Band</u>	<u>Wavelength, μm</u>
1	A	0.42 - 0.45
2	1	0.45 - 0.52
3	2	0.52 - 0.60
4	B	0.60 - 0.62
5	3	0.63 - 0.69
6	C	0.69 - 0.75
7	4	0.76 - 0.90
8	D	0.91 - 1.05
9	5	1.55 - 1.75
10	7	2.08 - 2.35
11	6	8.5 - 14.0 low gain
12	6	8.5 - 14.0 high gain

Sensor/aircraft parameters are as follows:

IFOV:	1.25 mrad
Ground Resolution:	81 feet (25 meters) at 65,000 feet
Total Scan Angle:	43°
Swath Width:	8.4 nmi (15.6 km) at 65,000 feet
Pixels/Scan Line:	716
Scan Rate:	12.5 scans/second
Ground Speed:	400 kts (206 m/second)

Information on data tape format, logical record format, and scanner calibration data may be obtained from the Aircraft Data Facility, NASA-Ames Research Center, Mail Stop 240-6, Moffett Field, California 94035-1000 (Telephone: 415-604-6252).

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 this deployment is as follows:

<u>Channel</u>	<u>Band edges μm</u>
2	0.529 - 0.572
3	0.635 - 0.688
4	0.896 - 0.927
5	1.595 - 1.652
6	1.805 - 1.855
7	1.855 - 1.905
8	1.905 - 1.955
9*	3.659 - 3.810
10*	8.342 - 8.738
11*	10.259 - 10.725
12*	11.799 - 12.246

* 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.)

Information on data tape format, logical record format, and scanner calibration data may be obtained from the Aircraft Data Facility, NASA-Ames Research Center, Mail Stop 240-6, Moffett Field, California 94035-1000 (Telephone: 415-604-6252).

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).

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). Additional information regarding ER-2 acquired photographic and digital data is also available.

CAMERA FLIGHT LINE DATA

FLIGHT NO. 93-086

Accession # 04555

Sensor # 076

Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
A - B	7414-7479	21:58:40	22:29:57	65000/19800	10-60% cirro-cumulus (frames 7414-7424); minor cumulus (frame 7426); 10-30% cirro-cumulus (frames 7428-7434); 10-100% cirrus and cumulus (frames 7438-7479); oblique (frame 7479)
C - D	7480-7533	22:34:10	22:59:26	"	30-100% cirrus and cumulus (frames 7480-7524); 10-20% cirrus (frames 7525-7526); stepwedge over print (frames 7531-7533)

TMS SCANNER FLIGHT LINE DATA

FLIGHT NO. 93-086

WADSWORTH FLIGHT DATA
 FLIGHT NUMBER: 93-086

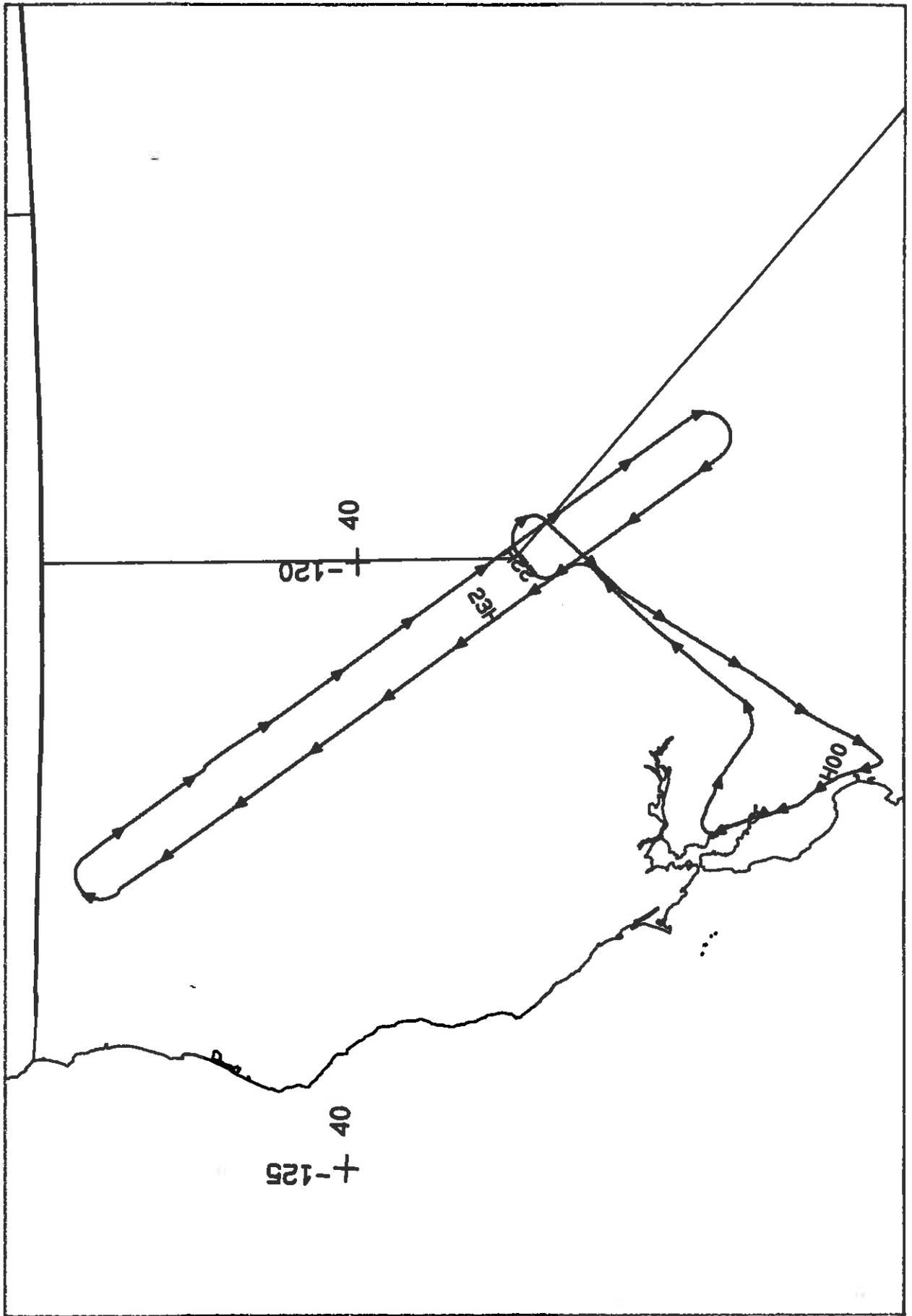
Check Points	Actual Time (GMT)	Actual begin	Actual end	Altitude feet/meter	Scan Speed (fps)	Total Ground Stationings	Total Incorporated Stationings	Total Reported Stationings
A - a	21:53:53.0	22:13:37.0	22:13:46.2	65000/19812	12.50	11574	1	0
a - B	22:13:59.0	22:13:24.0	22:13:26.6	65000/19812	12.50	11574	0	0
C - c	22:13:15.0	22:13:15.0	22:13:30	65000/19812	12.50	13697	4	0
c - E	22:13:15.0	23:14:1.0	23:14:27	65000/19812	12.50	13685	0	1
F - A	23:20:59.0	23:13:37.0	23:20:38	65000/19812	12.50	8613	1	0

MAS SCANNER FLIGHT LINE DATA

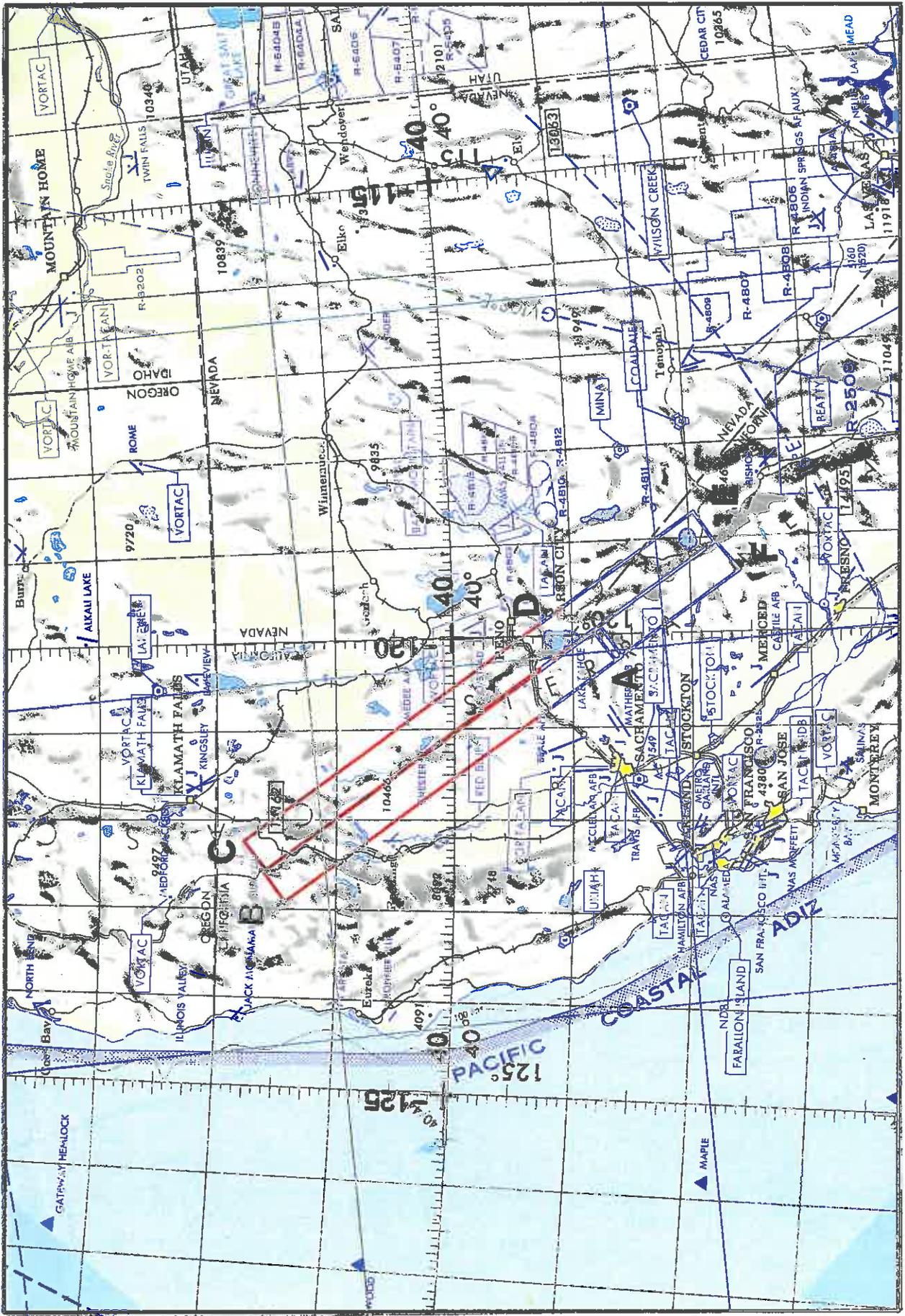
FLIGHT NO. 93-086

• DME-VALUS FLIGHT DATA
 FLIGHT NUMBER: 93-086

Check Points	Actual Time begin	Actual (GMT) end	Actual Scanline begin	Actual Scanline end	Altitude feet/meter	Scan Speed (fps)	Total		Total Repeated Scanlines
							Scanlines	Interpolated Scanlines	
A - B	21:58:55.0	22:29:12.0	14973	29757	65000/19312	6.20	11485	0	0
C - E	22:34:27.0	23:16:1.0	27838	43381	65000/19312	6.20	13543	1	0
F - A	23:20:32.0	23:51:37.0	43064	49321	65000/19312	6.20	4627	1	0



FLIGHT 93-086 20 APRIL 1993 A/C 708 TMS / MAS





JNC 43

Accession #04555

RC-10

A/C 709

20 APRIL 1989

FLIGHT 89-086