

FLIGHT SUMMARY REPORT

Flight Number: 94-051
Calendar/Julian Date: 25 February 1994 • 56
Sensor Package: Wild-Heerbrug RC-10
Modis Airborne Simulator (MAS)
Thematic Mapper Simulator (TMS)
Electro-Optic Camera System (EOC)
Area(s) Covered: Sierra Nevada Mountains

Investigator(s): Westerman, LMSC

Aircraft #: 708

SENSOR DATA

Accession #:	04700	-----	-----	-----
Sensor ID #:	026	108	111	074
Sensor Type:	RC-10	MAS	EOC	TMS
Focal Length:	12" 304.97 mm	-----	-----	-----
Film Type:	Aerochrome IR SO-060	-----	-----	-----
Filtration:	Wratten 12	-----	-----	-----
Spectral Band:	510-900 nm	-----	-----	-----
f Stop:	11	-----	-----	-----
Shutter Speed:	1/200	-----	-----	-----
# of Frames:	74	-----	-----	-----
% Overlap:	60	-----	-----	-----
Quality:	Good	Good		Poor
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 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 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. The following MAS band combination (configuration LMSC) was used on this flight:

<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	8	0.896 - 0.927
5	10	1.595 - 1.652
6	14	1.805 - 1.855
7	15	1.855 - 1.905
8	17	1.955 - 2.005
9	31	3.659 - 3.810
10	42	8.342 - 8.738
11	44	10.259 - 10.725
12	46	11.799 - 12.246

Sensor/Aircraft Parameters:

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

Electro-Optic Camera System

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

CCD Video Camera

IFOV:	0.2 mrad
Ground Resolution:	15.8 feet (4.81 meters at 65,000 feet)
Total Scan Angle:	13.96°
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 ^o 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).

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 through the Aircraft Data Facility

**CAMERA FLIGHT LINE DATA
FLIGHT NO. 94-051**

Accession # 04700

Sensor # 026

Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
A - B	3603-3625	20:00:22	20:10:50	65000/19800	10-80% cirrus and cumulus (frames 3603-3618)
C - D	3626-3649	20:14:37	20:25:32	"	10-20% cumulus (frames 3636-3638); minor-20% cumulus (frames 3643-3649)
E - F	3650-3676	20:31:11	20:43:29	"	10-90% cirrus and cumulus (frames 3650-3674)

TMS SCANNER FLIGHT LINE DATA

FLIGHT NO. 94-051

DATE: 05/11/1966
 FLIGHT NUMBER: 94-051

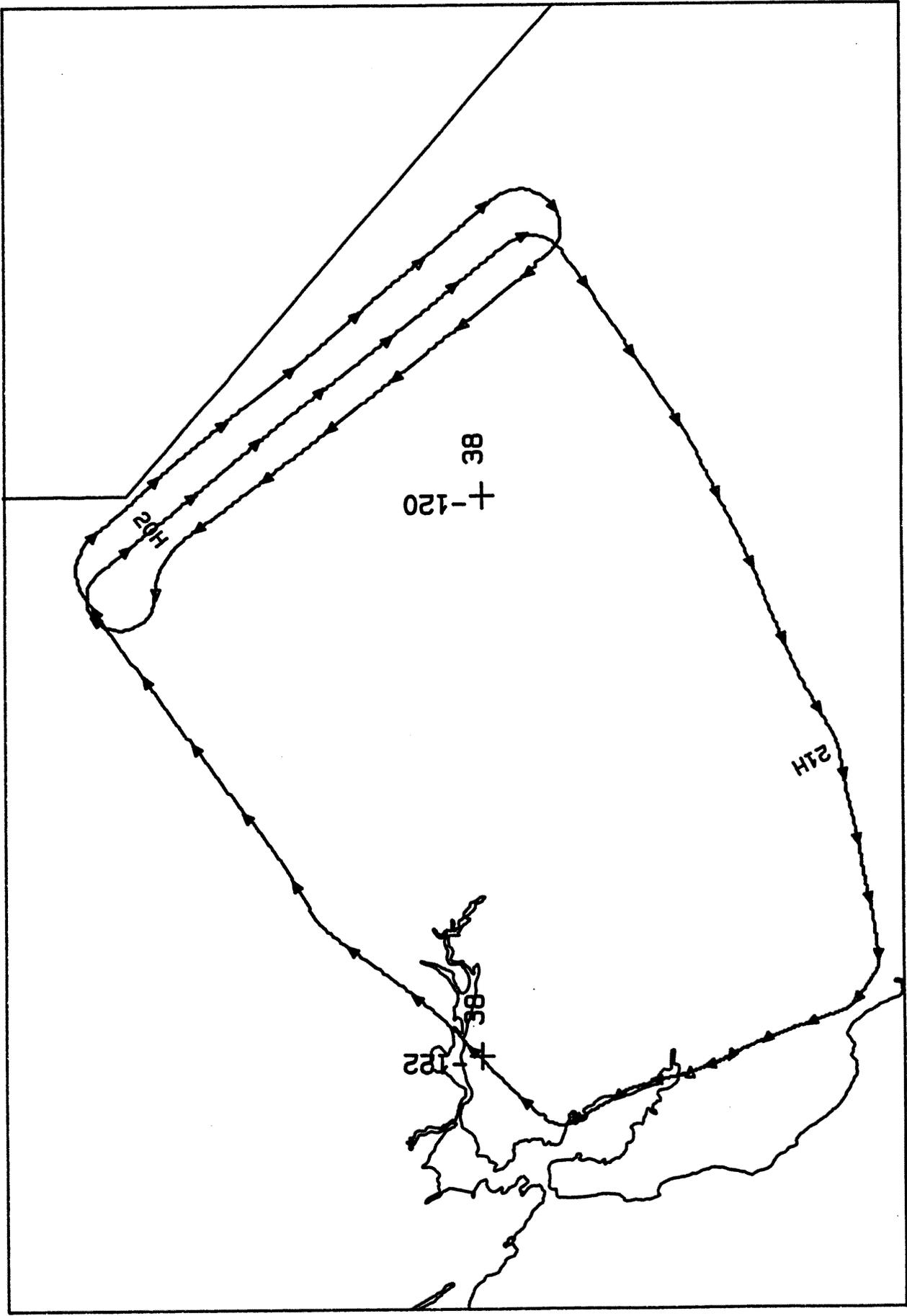
Check Points	Actual Time begin	Actual Time end	Actual		Altitude feet/meter	Scan Speed (fps)	Total		Total	
			begin	end			Scan lines	Interpolated Scanlines	Repeated Scanlines	
A-B	17:52:13.0	20:11:11.0	22703	38613	65000/17312	12.50	3711	0	0	0
C-D	20:14:29.0	20:25:42.0	41086	49403	65000/17312	12.50	8415	1	0	0
E-F	20:50:52.0	20:55:42.0	53363	63363	65000/17312	12.50	2406	0	0	0

MAS SCANNER FLIGHT LINE DATA

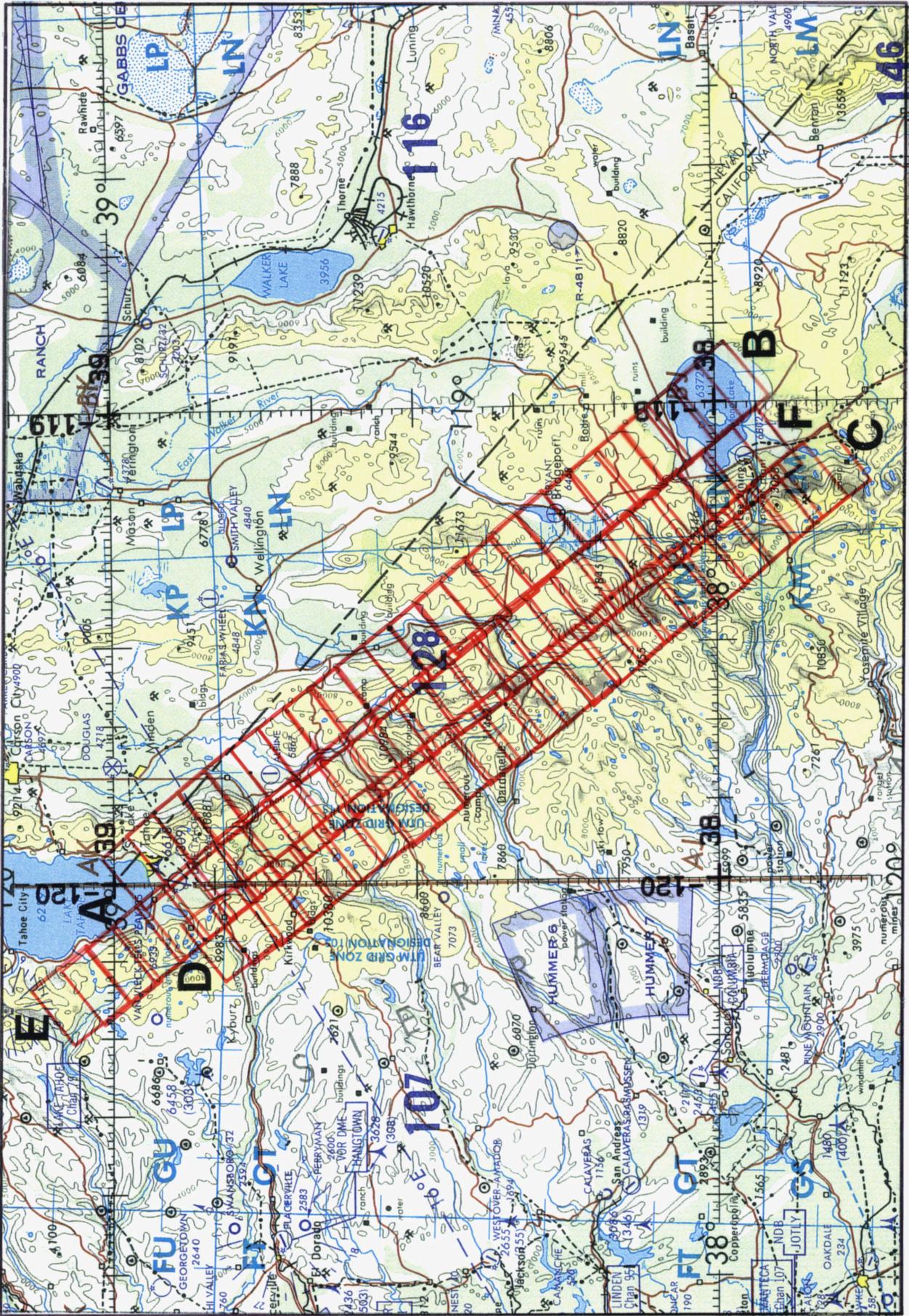
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DAEDALUS FLIGHT DATA FLIGHT NUMBER: 94-051

Check Points	A c t u a l t i m e b e g i n	A c t u a l s c a n l i n e b e g i n	A l t i t u d e f e e t / m e t e r	S c a n S p e e d (r p s)	t o t a l G o 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	19:58:51.0 20:11:2.0	14633 19187	65000/19812	6.25	4555	0	0
C-D	20:14:29.0 20:25:36.0	20474 24632	65000/19812	6.25	4158	1	0
E-F	20:31:10.0 20:43:37.0	26711 31364	65000/19812	6.25	4654	0	0



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ONC 9-19