FLIGHT SUMMARY REPORT

Flight Number: 93-093

Calendar/Julian Date: 30 April 1993 • 120

Sensor Package: Wild-Heerbrug RC-10
Modis-N Airborne Simulator (MAS)
Thematic Mapper Simulator (TMS)
NASA Aircraft Satellite Intrument Calibration (NASIC)

Area(s) Covered: Central Sierra Nevada

Investigator(s): Abel, GSFC

Aircraft #: 708

SENSOR DATA

Accession #:	04550	-----	-----	-----
Sensor ID #:	076	108	074	104
Sensor Type:	RC-10	MAS	TMS	NASIC
Focal Length:	12" 304.89 mm	-----	-----	-----
Film Type:	Aerochrome IR SO-134	-----	-----	-----
Filtration:	Wratten 12	-----	-----	-----
Spectral Band:	510-900 nm	-----	-----	-----
f Stop:	8	-----	-----	-----
Shutter Speed:	1/400	-----	-----	-----
# of Frames:	153	-----	-----	-----
% Overlap:	60	-----	-----	-----
Quality:	Fair	Poor	Good	-----
Remarks:	Data overexposed; camera clock offset 6.8 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:

Daedalus Channel	TM Band	Wavelength, μm
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 twelve 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:

Channel	Band edges µm
1	-----
2	0.635 - 0.688
3	0.852 - 0.893
4	1.595 - 1.652
5	1.805 - 1.855
6	2.126 - 2.173
7	3.659 - 3.810
8	13.630 - 14.147
9*	8.342 - 8.738
10*	10.791 - 11.239
11*	13.023 - 13.375
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. 93-093

Accession # 04550

Sensor # 076

Check Points	Frame Numbers	Time (GMT-hr, min, sec) START	Time (GMT-hr, min, sec) END	Altitude, MSL feet/meters	Cloud Cover/Remarks
A - C	7745-7786	22:02:24	22:22:11	65000/19800	Emulsion scratches (frame 7750); 10-30% scattered cumulus (frames 7776-7786)
C - D	7787-7793	22:22:40	22:25:33	"	Oblique frames in turn; 10-50% cumulus
D - F	7794-7807	22:26:02	22:32:17	"	10-50% cumulus (frames (7794-7803); 10% cumulus (frame 7807); oblique (frames 7801 and 7807)
F - G	7808-7813	22:32:46	22:35:10	"	10% cumulus (frames 7808-7809); oblique (frame 7813)
G - H	7814-7820	22:35:39	22:38:32	"	Clear; oblique (frame 7820)
H - J	7821-7835	22:39:01	22:45:44	"	Clear; oblique (frame 7822)
J - K	7836-7838	22:46:12	22:47:10	"	Clear; oblique frames in turn
K - M	7839-7886	22:47:39	23:10:07	51500/15700	10% cumulus (frames 7839-7840); altitude varies from 65000/19800 to 37400/11400 on data acquired during descent

CAMERA FLIGHT LINE DATA
FLIGHT NO. 93-093

Accession # 04550

Sensor # 076

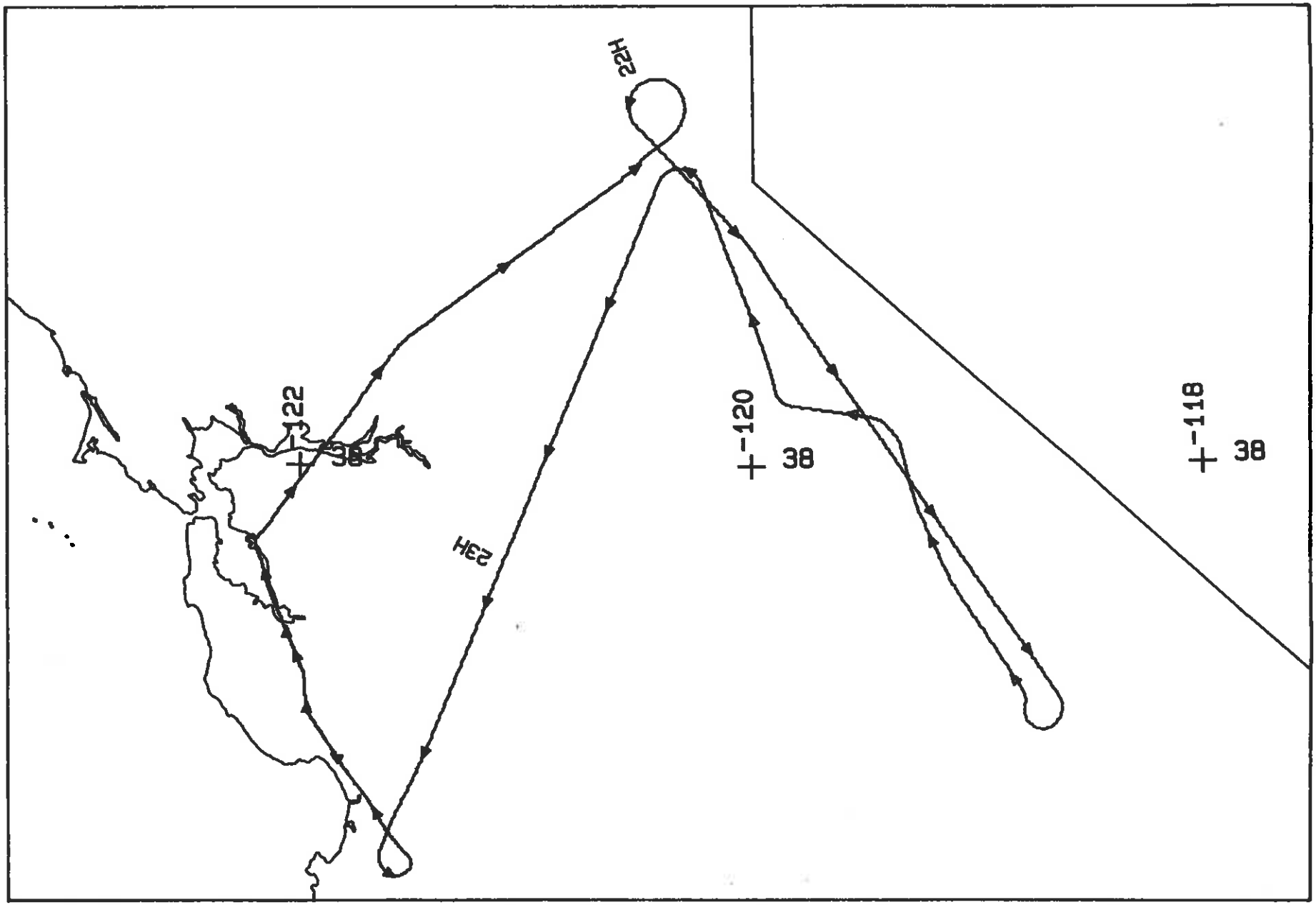
Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
M - N	7887-7893	23:10:36	23:13:27	32700/10000	Clear; oblique frames in turn
N -M	7894-7897	23:13:56	23:15:22	27200/8300	Clear

TMS SCANNER FLIGHT LINE DATA

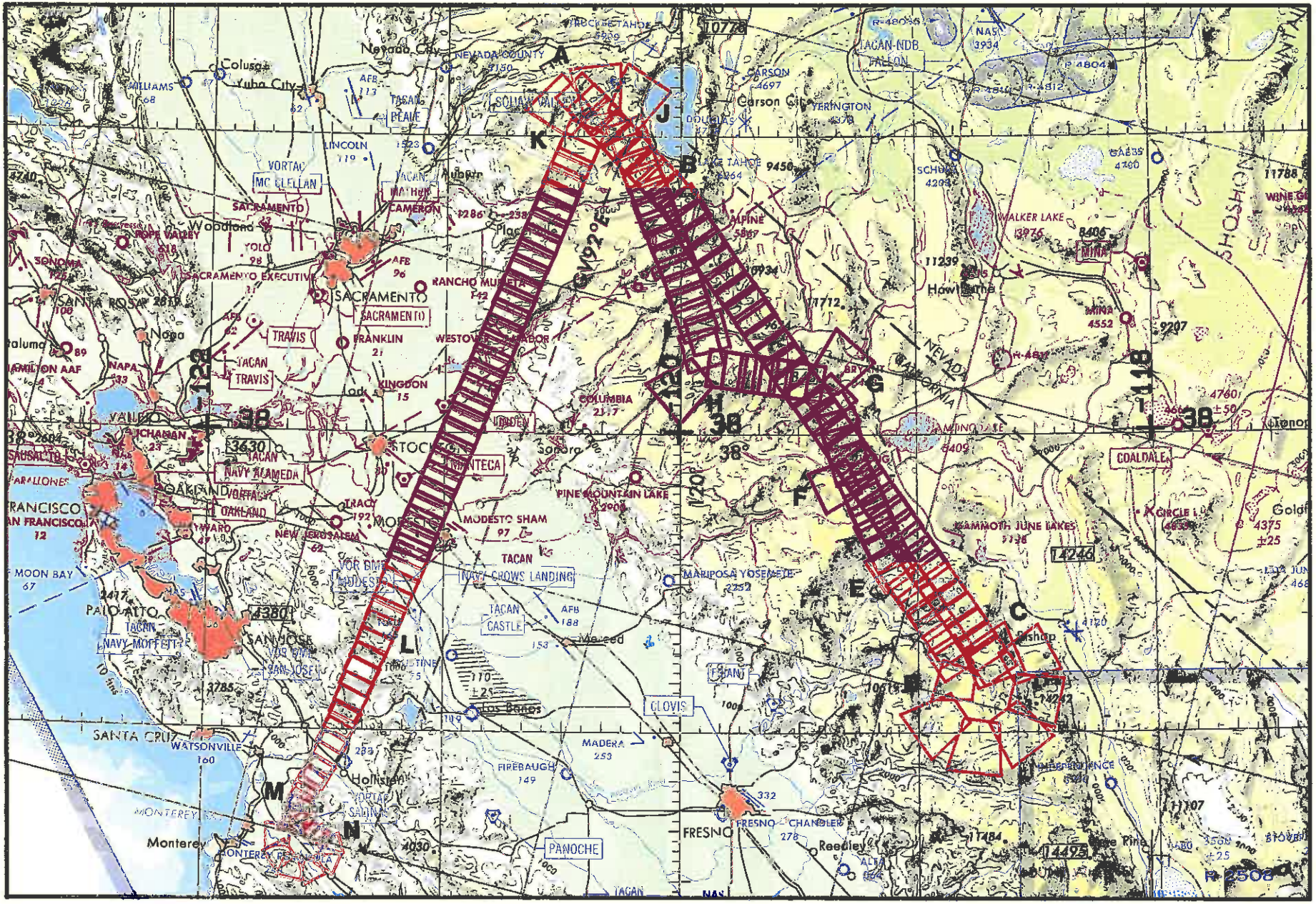
FLIGHT NO. 93-093

DAEDALUS FLIGHT DATA
FLIGHT NUMBER: 93-093

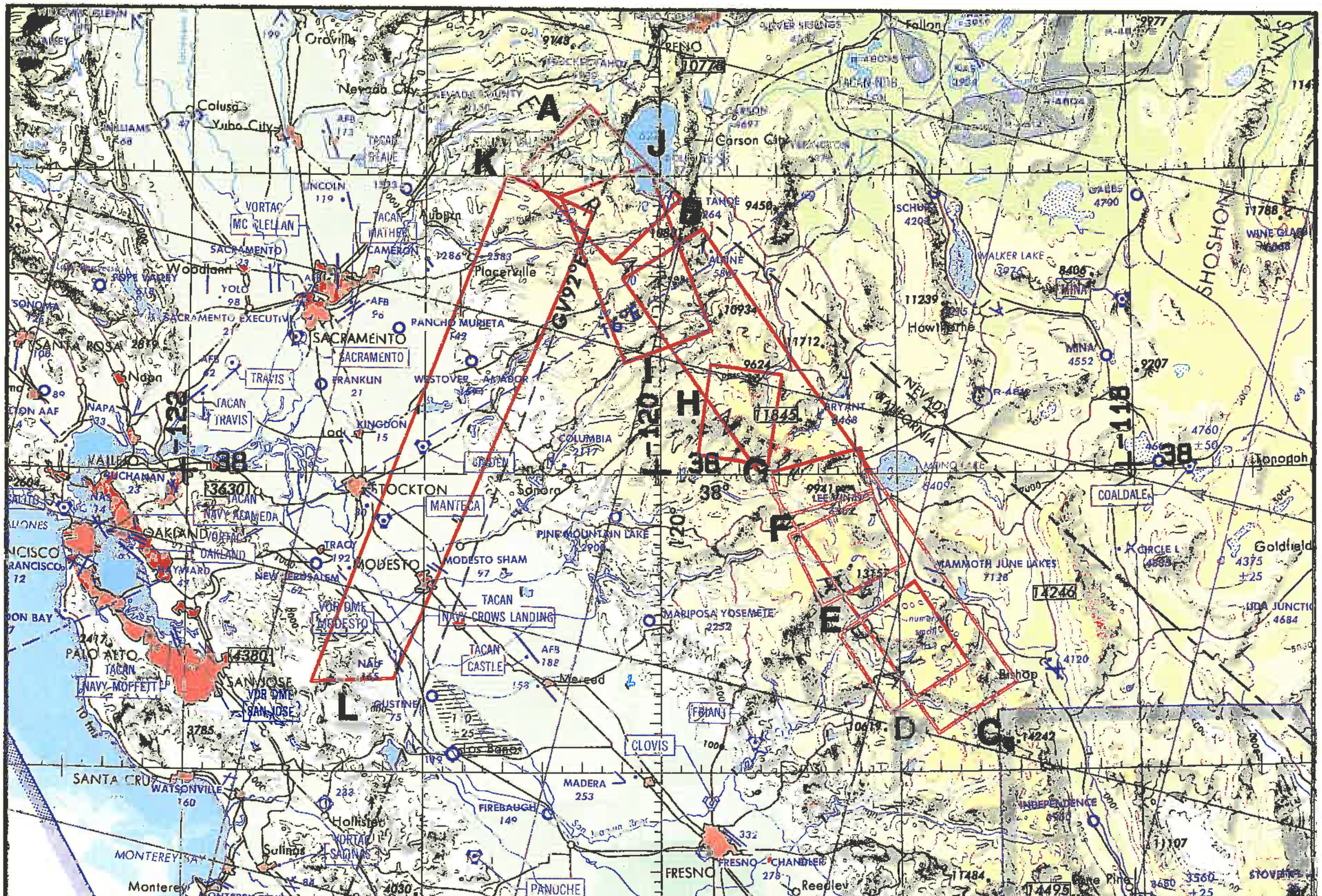
Check Points	Actual time (GMT) begin	end	Actual scanline begin	end	Altitude feet/meter	Scan Speed (rps)	total Good scanlines	total Interpolated scanlines	total Repeated scanlines
A - B	22:02:17.0	22:06: 0.0	14826	16214	65000/19812	6.20	1388	0	0
B - C	22:06:48.0	22:22:27.0	16510	22351	65000/19812	6.20	5842	0	0
D - E	22:25:10.0	22:27: 5.0	23737	24806	65000/19812	6.20	1070	0	0
E - F	22:29:53.0	22:32: 1.0	25123	25915	65000/19812	6.20	793	0	0
F - G	22:32:33.0	22:33:52.0	26114	26609	65000/19812	6.20	496	0	0
G - H	22:35:44.0	22:37:51.0	27301	28093	65000/19812	6.20	793	0	0
I - J	22:40:14.0	22:45:33.0	28984	30914	65000/19812	6.20	1931	0	0
K - L	22:47:56.0	23:04:59.0	31855	37687	65000/19202	6.20	5832	0	0



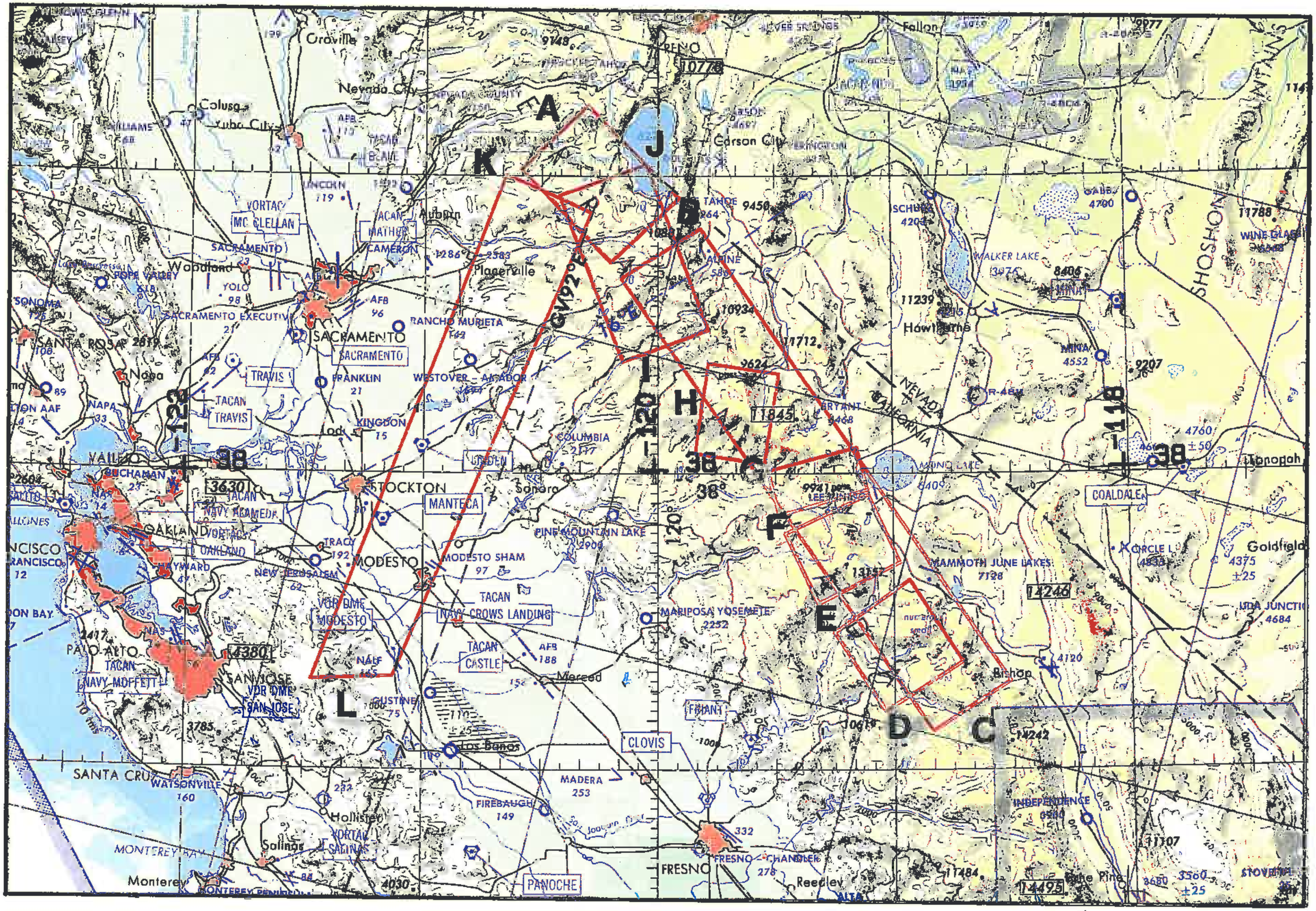
FLIGHT 93-093 30 APRIL 1993 A/C 708 TMS / MAS



FLIGHT 93-083 30 APRIL 1993 A/C 708 RC-10 JNC 43



FLIGHT 93-093 30 APRIL 1993 A/C 708 MAS / TMS JNC 43



FLIGHT 93-083 30 APRIL 1993 A/C 708 MAS / TMS JNC 43